

BLACK CARBON—A GLOBAL HEALTH PROBLEM WITH LOW-COST SOLUTIONS

HEARING

BEFORE THE

SUBCOMMITTEE ON CLEAN AIR
AND NUCLEAR SAFETY

OF THE

COMMITTEE ON
ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

ONE HUNDRED THIRTEENTH CONGRESS

FIRST SESSION

SEPTEMBER 24, 2013

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ONE HUNDRED THIRTEENTH CONGRESS
FIRST SESSION

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TUESDAY, SEPTEMBER 24, 2013

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY,
Washington, DC.

The Subcommittee met, pursuant to notice, at 10:30 a.m. in room 406, Dirksen Senate Building, Hon. Thomas R. Carper (chairman of the Subcommittee) presiding.

Present: Senators Carper, Whitehouse, Inhofe, Sessions, and Boozman.

OPENING STATEMENT OF HON. THOMAS R. CARPER, U.S. SENATOR FROM THE STATE OF DELAWARE

Senator CARPER. Good morning. The Committee will come to order, I think it already is in order. We are happy that you all are here on this beautiful, beautiful September morning.

I am happy to be here with Senator Sessions and Senator Inhofe. Especially I want to acknowledge Senator Inhofe. I have been privileged to work with him on these issues and I think we are making good progress. We made good progress with the leadership of George Voinovich in previous Congresses. I saw him about 2 weeks ago and he was anxious to know that the work he pioneered is working and that we are continuing it. I think he could feel good about it. I know I do and I hope my colleagues do as well. Thank you.

Today's Subcommittee hearing will review the health impacts of black carbon and review cost effective technologies, strategies and Federal programs with the highest potential to reduce black carbon emissions. Senators will have 5 minutes for their opening statements.

We will then recognize our panel of witnesses. Each witness will have about 5 minutes for their opening statement. If you go way over that, we will rein you in. If you don't, we will be OK.

Following the panel's statements, we will have two rounds of questions. And I think we may have a vote around 11:45; we will see how that works.

My colleagues and I were sent to Washington to govern and to find commonsense solutions to the challenges that face our Nation. I don't believe that Americans are especially interested in Democratic ideas or Republican ideas. They are interested in good ideas, and they are interested in ideas that will work and that we can agree on to make our country better and our air cleaner.

Cleaning up black carbon and dirty diesel emissions provides us with an opportunity to work across the aisle, something that the three of us are pretty good at doing, but not all of us are as often as we should be.

For folks that don't know, black carbon emissions, sometimes called soot, are the dark particles emitted when fossil fuels, when biomass and biofuels are burned. Black carbon particles make up a large part of the Nation's fine particulate matter, pollution. Once in the air, these black carbon particles absorb heat from the sun, causing a warming effect to the atmosphere, and can speed up the melting process for lands on snow or ice.

Black carbon can also cause serious health impacts. These particles are pretty small, they get lodged deep in our lungs and cause respiratory illnesses, including bronchitis, asthma, lung cancer and even premature death. Indoor and outdoor emissions of black carbon are estimated to cause millions and millions of premature deaths worldwide each year. Many of these deaths occur overseas in developing countries.

There is still much we don't know about the health impacts of black carbon. That is why in 2009, Senator Inhofe and I asked the EPA to study black carbon and report back to Congress. We received that report about 3 years later, in 2012. Since then, the international scientific community has been very focused on this issue.

I look forward to today's testimony, we look forward to today's testimony, to hear an update on the health and climate impacts of black carbon. Although we are still learning about the full extent of black carbon's impact on our health and on climate change, we do know what it takes to reduce harmful emissions. And we have technology, technology that, as our witnesses know, especially one of you, technology that is designed and made in America, to reduce these emissions.

Over half of our country's black carbon emissions and a large part of global emissions come from older, dirty, diesel engines, the kinds of engines that we find in school buses and bulldozers and large vehicles and trains and boats and in trucks. As we will hear from our witnesses today, we have clean diesel engines made in America today that are reaching near zero emissions. Isn't that a great success story? And while that is wonderful news, it was nothing to address the pollution coming from millions of engines already in use, likely to be operating and polluting for the next 20 years. What do they say about diesel engines? The good news is they last a long time. And the bad news is that they last a long time.

Despite new engine standards, the EPA estimates that there are some 11 million old diesel engines in America lacking the latest pollution control technology. In 2005, our friend, the former Senator, Governor George Voinovich, came to meet a number of us with an idea to address the dirty diesel engine backlog, which soon was signed into law as the Diesel Emissions Reduction Act, affectionately known as DERA. Through DERA, the EPA provided voluntary incentives to diesel engine owners to retrofit or replace their vehicles early. DERA turned out to be a great idea, not just a great

idea but actually great policy, averaging more than \$13 in health benefits for every \$1 in funding.

Since it was enacted, DERA has helped replace or retrofit thousands of old school buses, 2,000 school buses in Mississippi alone. Since up to 90 kids can ride on an average school bus, that is up to 180,000 kids in Mississippi that are breathing better on their way to school because of this law. By cleaning up our school buses, DERA reduces our black carbon emissions and employs thousands of workers who manufacture, who sell or repair diesel vehicles and install the components in each State. It is a true win-win situation.

In 2012, we reauthorized the DERA program through 2016, and made some changes to try to improve DERA's effectiveness. Unfortunately, every year our President's budget has decreased funding for the DERA funding. I appreciate the dedication to reducing the Federal deficit, but some investments are actually worth paying for, especially when they have a 13 to 1 payoff. Even during these challenging times, that is not a bad payoff or a bad return on investment.

Cutting such a successful program is, I think penny-wise but pound foolish, which is why I am going to work with my colleagues here and across the Committee to restore funding for this effective law.

Although DERA is a great success, more can be done to reduce our black carbon diesel emissions. For example, the bulldozers, diggers, backhoes that build the Nation's infrastructure, transportation infrastructure especially, produce some 25 percent of America's mobile diesel emissions, 25 percent. But because of who owns these construction vehicles and how they are used, DERA has not been as effective at reducing emissions for much of the Nation's construction equipment.

To better address this problem, last Congress I introduced the Clean Construction Act of 2011. Its commonsense approaches are simple. In the areas of poor air quality, Federal transportation projects should reduce, not increase, deathly diesel emissions. Major provisions of this legislation made it into the Senate-passed Transportation Reauthorization bill. I want to thank some of my colleagues who helped make that happen. Unfortunately, nearly all the language was subsequently removed during conference with the House.

As we look to a new transportation bill, and we are always looking to a new transportation bill, it seems, I will continue my efforts, we will continue our efforts on that.

In closing, we look forward to today's testimony and we are looking forward to learning more about the health impacts of carbon and what more we could do, can do, and smarter ways to reduce emissions. I believe if we continue to work together on this issue, and I am encouraged that we will, we can build on the progress we have already made and use our resources wisely to reduce black carbon emissions at home and abroad.

With that, I am delighted to turn it over to our ranking member, Senator Jeff Sessions.

[The prepared statement of Senator Carper follows:]

STATEMENT OF HON. THOMAS R. CARPER,
U.S. SENATOR FROM THE STATE OF DELAWARE

My colleagues and I were sent to Washington to govern and to find common-sense solutions to the challenges facing our Nation. I don't believe Americans are especially interested in Democratic ideas or Republican ideas. They want us to come up with ideas that will work and we can all agree on to make our country even better.

Cleaning up black carbon and dirty diesel emissions provides us an opportunity to work across the aisle, something we do too rarely these days.

For folks that don't know, black carbon emissions—sometimes called soot—are the dark particles emitted when fossil fuels, biomass and biofuels are burned. Black carbon particles make up a large part of our Nation's fine particulate matter pollution.

Once in the air, these black carbon particles absorb heat from the sun—causing a warming effect in the atmosphere and can speed up the melting process if it lands on snow or ice.

Black carbon can also cause serious health impacts. These particles can get lodged deep in the lungs and cause respiratory illnesses such as bronchitis, asthma, lung cancer, and premature death. Indoor and outdoor emissions of black carbon are estimated to have caused millions of premature deaths worldwide each year—many of these deaths occur overseas in developing countries.

There is still much we don't know about the health impacts of black carbon. That is why in 2009, Senator Inhofe and I asked the EPA to study black carbon and report back to Congress.

We received EPA's report in 2012—and since then the international scientific community has been very focused on this issue. I look forward to today's testimony to hear an update on the health and climate impacts of black carbon.

Although we are still learning about the full extent of black carbon's impact on public health and climate change, we do know what it takes to reduce harmful emissions. And we have technology that's designed and made in America to reduce these emissions.

Over half of our country's black carbon emissions and a large part of global emissions come from old, dirty diesel engines. The kinds of engines you'd find in school buses, bulldozers and other large vehicles.

As we will hear from our witnesses, clean diesel engines made in America today are reaching near zero emissions. While that is great news, it does nothing to address the pollution coming from the millions of engines already in use that will likely be operating—and polluting—for the next 20 years.

Despite new engine standards, the EPA estimates there are 11 million old diesel engines in America lacking the latest pollution control technology. In 2005, our friend former Senator George Voinovich came to me with an idea to address the dirty diesel engine backlog—which soon was signed into law as the Diesel Emissions Reduction Act (DERA). Through DERA, the EPA provides voluntary incentives to diesel engine owners to retrofit or replace their vehicle early.

DERA turned out to be a great idea—averaging more than \$13 in health benefits for every \$1 in funding. Since it was enacted, DERA has helped replace or retrofit thousands of old school buses—2,000 school buses in Mississippi alone. Since up to 90 kids can ride on an average school bus, that's up to 180,000 kids in Mississippi that are breathing better on their way to school because of this law.

By cleaning up our school buses and ports, DERA reduces our Nation's black carbon emissions and employs thousands of workers who manufacture, sell or repair diesel vehicles and their components in each State. It is a true win-win.

In 2010, we reauthorized the DERA program through 2016 and made some changes to try to improve DERA's effectiveness. Unfortunately, every year the President's budget had decreased funding for the DERA program.

I appreciate dedication to reducing the Federal deficit, but some investments are worth paying for, even during these challenging financial times. Cutting such a successful program is penny wise and pound foolish, which is why I will work with my colleagues to restore funding for this effective law.

Although DERA is a great success, more can be done to reduce our black carbon diesel emissions. For example, the bulldozers, diggers, and backhoes that build our Nation's infrastructure produce 25 percent of America's mobile diesel emissions. But because of who owns these construction vehicles and how they are used, DERA has not been as effective at reducing emissions from our Nation's construction equipment.

To better address this problem, last Congress I introduced the Clean Construction Act of 2011. This common-sense approach is simple: in areas of poor air quality, Federal transportation projects should reduce, not increase, deadly diesel emissions. Major provisions of this legislation made it into the Senate-passed transportation

reauthorization bill. Unfortunately, nearly all the language was subsequently removed during conference with the House. As we look to a new transportation bill, I will continue my efforts on this front.

In closing, I look forward to today's testimony to learn more about the health impacts of black carbon and what more we could do to reduce emissions. I believe if we continue to work together on this issue we can build on the progress we have already made and use our resources wisely to reduce black carbon emissions at home and abroad.

Senator SESSIONS. Thank you, Mr. Chairman, for those good remarks, and thank you for the kind of leadership you provide to us. You set a good example on how the Senate ought to operate.

I thought I would yield to Senator Inhofe. He has been active on this issue for a number of years and is our ranking member of the full Committee, formerly ranking member of the full Committee. Senator Inhofe, I would yield to you.

**OPENING STATEMENT OF HON. JAMES M. INHOFE,
U.S. SENATOR FROM THE STATE OF OKLAHOMA**

Senator INHOFE. Thank you, Senator Sessions. I do thank you.

So that you will be aware, the five of you, and that we are aware, I am not on this Subcommittee. However, I was chairman of this full Committee when the Republicans were in the majority, and I am very active on it. This Committee has the largest jurisdiction of any committee in the U.S. Senate. It covers a lot of things.

So I think that this issue, you are going to find during the course of this, is not really a partisan issue. So this is kind of an unusual subject that we are dealing with here.

I think the chairman has done a good job explaining what black carbon is. Everybody knows what that is. I would like to say that we have, this has nothing to do with global warming or carbon dioxide. I do think it is important for all of us to understand that this is something that is very significant in the third world countries. I happen to kind of specialize in one area of Africa; in fact, I have made 127 African country visits. The one thing that is consistent throughout Africa is the harmful emissions that stem largely from the indoor use of cookstoves filled with tree bark and dung. According to a recent study by the Bill and Melinda Gates Foundation, black carbon causes 3.5 million deaths annually in these countries, I am talking about Africa now, which is more than malaria and AIDS combined.

Now, that is incredible. But that is true. That is what we are dealing with here. So it is significant. One of the simplest ways we can reduce this type of pollution is to increase access to electricity in these poorer regions in the world. While many may not realize it, there are significant hurdles caused by U.S. policies that make it difficult for U.S. companies to invest in and build power plant projects in low-income areas.

The Overseas Private Investment Corporation, OPIC, is a Government entity that facilitates investment in high-risk environments by providing political risk insurance. Many of the world's poorest regions are also the most politically volatile. So many companies will not invest in these countries unless they have insurance that would cover their losses in the event the government seized their assets or something similar to that, which we know happens

quite often in the third world countries. OPIC sells insurance to cover this risk.

Unfortunately, in 2007 a rider was attached to an appropriations bill that prohibits OPIC from writing insurance on projects that may increase greenhouse gas emissions. This language effectively prohibits U.S. involvement in power projects that use traditional fuels such as coal, oil and natural gas for the misguided goal of combating global warming.

In reality, the only impact of this language is that it levies the cost of global warming regulations on the backs of the world's poorest people. If we remove this language and OPIC was allowed to offer insurance to these projects, U.S. firms would be able to safely, cheaply and effectively generate electricity to the poorest areas of the world. This would enable these families to affordably use electric power stoves which would significantly reduce the risk of black carbon filling the homes as families' meals are cooked.

In short, you almost have to go there and see this, and see what they are using today. It is such a no-brainer that we ought to help them develop what they can to offset this. Small change in U.S. policy that wouldn't cost a dime could dramatically reduce the number of deaths caused by black carbon pollution worldwide. I am eager to pursue a change in this law, so that we can help the most impoverished obtain access to cheap power and cleaner electric powered stoves.

Domestically, the Diesel Emissions Reduction Act program has been a big success. It was created in the Energy Policy Act. Actually it was in a different committee, but it was at a time in 2005 when I chaired this Committee. So we were very much involved in it. It provides Federal and State grants to manufacturers to rebuild diesel engines or install emissions reduction systems to diesel vehicles to comply with State and Federal laws.

In 2010, when I was the ranking member of this Committee, I was one of the primary champions of this Diesel Emissions Reduction Act, with Chairman Carper and Senator Voinovich, who is no longer in the U.S. Senate. Each year, DERA helps clean up more than 14,000 diesel-powered vehicles and equipment across the country.

What a lot of people don't know is, and even my colleagues here are probably not aware that the majority of school buses that are powered by the diesel engines, and then of course the old ones that are still there, were manufactured not just in my State but in my city of Tulsa, Oklahoma. So we have an opportunity to do something about it. Robert, I appreciate very much your being here. And I will not be able to be here during your testimony but I have read it, and I agree with your efforts. We need to have your help along with the other members of this panel.

Thank you, Mr. Chairman.

[The prepared statement of Senator Inhofe follows:]

STATEMENT OF HON. JAMES M. INHOFE,
U.S. SENATOR FROM THE STATE OF OKLAHOMA

Thank you, Chairman Carper and Ranking Member Sessions, for holding this hearing today. First, I should point out that black carbon has nothing to do with global warming or carbon dioxide.

It is, however, an important topic, especially on the continent of Africa. What a lot of people don't know is that I have traveled to Africa more than any other Senator in the history of the United States. I have made 127 individual country visits, and the issue of black carbon has come up almost everywhere I've been—whether it's Burundi or Zambia.

Black carbon—the common name for fine particulate matter, or soot—is a pollutant that can cause negative health effects—and even death—when breathed in high concentrations.

In lower income countries, like those in Africa, the problem is massive compared to the United States. These harmful emissions stem largely from the indoor use of cook-stoves fueled by tree bark, dung, and other high-pollutant, unhealthy materials.

According to a recent study by the Bill and Melinda Gates Foundation, black carbon causes 3.5 million deaths annually in these countries—which is more than malaria and AIDS combined.

One of the simplest ways we can reduce this type of pollution is to increase access to electricity in these poor regions around the world. And while many may not realize it, there are significant hurdles caused by U.S. policies that make it difficult for U.S. companies to invest in and build power plant projects in low-income countries.

The Overseas Private Investment Corporation (OPIC) is a Government entity that facilitates investment in high-risk environments by providing political risk insurance. Many of the world's poorest regions are also the most politically volatile, so many companies will not invest in these countries unless they have insurance that would cover their losses in the event the government seized their assets or something similar to that. OPIC sells insurance to cover this risk.

Unfortunately, in 2010, a rider was attached to an appropriations bill that prohibits OPIC from writing insurance on projects that may increase greenhouse gas emissions. This language effectively prohibits U.S. involvement in power projects that use traditional fuels such as coal, oil, and natural gas for the misguided goal of combating global warming. In reality, the only impact of this language is that it levies the cost of global warming regulations on the backs of the world's poorest people.

If we removed this language and OPIC was allowed to offer insurance to these projects, U.S. firms would be able to safely, cheaply, and effectively generate electricity for the world's poorest. This would enable these families to affordably use electric-powered stoves, which would significantly reduce the risk of black carbon filling homes as family meals are cooked.

In short, a small change in U.S. policy—that wouldn't cost a dime—could dramatically reduce the number of deaths caused by black carbon pollution worldwide, and I am eager to pursue a change in this law so that we can help the most impoverished obtain access to cheap power and cleaner electric-powered stoves.

Domestically, the Diesel Emissions Reduction Act (DERA) program has been a big success. It was created in the Energy Policy Act of 2005 and provides Federal and State grants to manufacturers to rebuild diesel engines or install emission reduction systems to diesel vehicles to comply with State and Federal emission requirements.

In 2010, when I was Ranking Member of this Committee, I was one of the primary champions of the DERA Act of 2010 with Chairman Carper and Senator Voinovich, which reauthorized the program through 2016.

Each year, DERA helps clean up more than 14,000 diesel-powered vehicles and equipment across the country, which has reduced emissions while employing thousands of workers who manufacture, sell, or repair diesel vehicles and their components in each State. I am proud to say this bill was signed into law on January 4, 2011.

The voluntary DERA program has been utilized by Oklahoma to effectively reduce a real pollution risk in a cost effective way. We'll hear the specifics about this from Mr. Singletary, but among other things, we've been able to replace dozens of old school buses with up-to-date vehicles and install upgraded equipment on hundreds of others.

I want to thank Robert for taking the time to come up and discuss how this program has been implemented by our State. He works in the Air Quality division of the General Counsel's office at the Oklahoma Department of Environmental Quality and has been instrumental in ensuring the program's effectiveness. Robert, thanks again for being here.

Senator CARPER. Senator Inhofe, thank you. Thanks for coming by and joining us and for your steadfast support on this front. It is great to work with you.

Senator Sessions is next, and then Senator Boozman, welcome, and Senator Whitehouse, welcome. If you would like to make a statement as well, you are welcome to do that.

**OPENING STATEMENT OF HON. JEFF SESSIONS,
U.S. SENATOR FROM THE STATE OF ALABAMA**

Senator SESSIONS. Thank you. Senator Inhofe knows what he is talking about when he talks about Africa. We should call him the Senate's Ambassador to Africa. No one has been there more, and been in some of the most remote areas and met with real people. I think that insight into the advantage of electricity over burning of waste products is certainly valuable to us all.

Matter of fact, I have heard it said that the life span of people in a country where electricity is readily available is twice that where it is not. So there are all sorts of advantages for having electricity. In the long run, I think even a less than perfect plant would be better than burning individual fires in people's homes, wouldn't you agree, Jim?

Senator INHOFE. I would.

Senator SESSIONS. Mr. Chairman, you are a great leader, we thank you for that. We just had a big announcement about carbon dioxide standards last week. We are on a positive note today, this is something we can really agree about. You have been an advocate for these reforms for some time.

Last year, due to the work of Chairmen Carper and Inhofe, the EPA issued a 388-page report to Congress on black carbon and found that the United States contributes 8 percent of global emissions of black carbon. A key source of that in the United States is diesel exhaust emissions from large trucks, ships, trains, school buses and construction equipment. The remaining 92 percent comes from outside the United States. Globally, black carbon comes often from pollution in underdeveloped nations, as we have discussed.

Other key findings of the EPA report is that substantial progress has been made and is being made in reducing carbon emissions from diesel engines. EPA data shows that black carbon emissions from mobile sources, vehicles, dropped more than 30 percent from 1990 to 2005, and that "continued reductions are expected for mobile sources in the next two decades." In fact, the EPA report says "total mobile source black carbon emissions are projected to decline by 86 percent by 2030 due to regulations already promulgated."

So we will hear today from Bob Harris, from the Port of Mobile, a typical industrial activity active port, on the things that they have done and some of the grants that Federal money provided helped them make major progress. The Department of Energy report in 2009, Light Duty Diesel Vehicles, Market Issues and Potential Energy and Emission Impacts, was a report I asked for in 2009. I wanted to get a comparison of the characteristics of diesel-fueled vehicles with those from the hybrid vehicles, E85-fueled vehicles and other normal gasoline vehicles.

The report found "Diesel vehicles show a fuel economy advantage of 20 to 40 percent over gasoline vehicles, depending on the size and duty requirements of the vehicles." The report identified "several impediments to the market success of diesel vehicles in the

United States, including more stringent Federal and State standards for emissions, cost premiums, they cost more for diesel vehicles, limited availability of light duty diesel vehicles and higher retail prices for diesel fuel than conventional gasoline.” And we know that Europe uses a good bit more of diesel engines in their normal automobile fleet.

Mercedes Benz in Alabama builds the M class and the GL class at their Tuscaloosa, Alabama facility. They come with this most modern Bluetec diesel engine. Their fuel economy for the E250 Bluetec engine is 45 miles per gallon on the highways. And the 250 Bluetec has a 33 percent advantage in the city and combined EPA fuel economy over the gasoline counterpart, and a 50 percent advantage in highway fuel economy. They tell me that the payback for the engine is immediate and it has a higher resale value.

So there are a number of programs that we have. GAO has issued a report saying that there are 14 programs that provide grant or loan funding to reduce mobile source diesel emissions, disbursing \$1.4 billion from fiscal years 2007 to 2011. Perhaps we could combine some of those, create some efficiencies and it would probably be appropriate for us, Mr. Chairman, as you noted, to evaluate how we can make this program work even better.

Thank you.

Senator CARPER. Thank you very, very much, Senator Sessions. Thanks for letting me be your wingman here.

Senator BOOZMAN, if you would like to make your comments now, please proceed.

**OPENING STATEMENT OF HON. JOHN BOOZMAN,
U.S. SENATOR FROM THE STATE OF ARKANSAS**

Senator BOOZMAN. Yes, thank you, Chairman Carper and Ranking Member Sessions. Again, I appreciate you for holding today’s Subcommittee hearing.

I have been glad to work with you to reduce harmful emissions and make our air cleaner. Senator Carper, Senator Inhofe, Senator Sessions and others have been true leaders, for example, in the Diesel Emissions Reduction Act.

Diesel engines are vital to our economy. We know that older diesel engines contribute about 50 percent of our Nation’s black carbon emissions. The Diesel Emissions Reduction Act, or DERA, has received very broad bipartisan support, and I was pleased to be the lead Republican on efforts to secure adequate funding during the 112th Congress. I now work on this issue as a member of the Appropriations Committee. DERA supports funding for retrofits of diesel engines, reducing harmful emissions by as much as 90 percent.

Clean air is not a partisan issue on Capitol Hill. Unfortunately, we have seen this Administration’s proposed to slash funding for this funding by 70 percent, while continuing to waste money on far less effective environmental initiatives. For example, they continue to aggressively pursue the greenhouse gas emissions standards that will cost American jobs without having any significant impact on the climate.

On the other hand, with DERA and similar efforts, we work together to protect our air and resources. This type of conservation

and protection will continue to receive broad bipartisan support on Capitol Hill, because we see clear, science-based evidence that the policy will address a legitimate problem and have a substantial impact.

Again, I appreciate the hearing today, and I appreciate working with you, Mr. Chairman, and the ranking member, and I look forward to hearing the testimony of our witnesses. Thank you all for being here.

Senator CARPER. Let me just say we very much welcome your statement, we welcome your participation. This is a great bipartisan issue and if we work together it is amazing what we will get done.

Senator BOOZMAN. I agree.

Senator CARPER. Thank you, sir.

Senator Whitehouse, good morning.

**OPENING STATEMENT OF HON. SHELDON WHITEHOUSE,
U.S. SENATOR FROM THE STATE OF RHODE ISLAND**

Senator WHITEHOUSE. Thank you, Senator Carper and Senator Sessions, for hosting this hearing and for the terrific way that you are working together on this issue.

We are all very aware of the health effects of black carbon through asthma and bronchitis and lung cancer. It is also a potent climate pollutant, running hundreds of times more dangerous or more impactful on global warming than carbon dioxide. Thankfully it is not up there for as long. But while it is, it does a lot of global warming damage. Then of course it falls, and when it lands on snow and ice, it reduces the albedo, the shininess, so it absorbs more heat and there is more melt, and on you go.

So it has both health and climate effects. I think this is an area where we cannot only work together as a Nation, but also work internationally. I traveled with Senator McCain to China over the August recess. It looked like we landed at dusk. There was a big time change, so I wasn't really exactly sure what time it was. It wasn't dusk, it was mid-afternoon. It just looked like dusk because the pollution was so bad over Beijing. It has gotten to the point where the Chinese government is getting a bit anxious about popular unrest on this subject. So they are really serious about cleaning this up, and black carbon is a good place to work together internationally as well.

I would like to ask your consent, everybody's consent, if I could enter an article from MIT Technology Review into the record, and just close by observing that this is solvable problem. Solving it will benefit American manufacturing and protect public health and move us forward on climate change.

[The referenced information follows:]

speech-recognition and virtual-assistant software.

Using Sense.ly's platform, patients can communicate their condition to an emotionally reactive avatar through their phone, desktop, or TV. The avatar asks the patient simple questions, and if programmed by a doctor, it can answer questions too—such as what a diabetes patient with high blood-sugar readings should eat that day. The software also collects data from other medical devices that a patient uses, such as a glucose meter. The reports sent to the doctor include red-flag notifications that should

"We don't want to replace therapists. But ... it does replace the need to have them there all the time."

be acted on right away; charts, graphs, and analytics tracing the patient's progress over time; and a transcript of the voice interaction.

"A physician's time is always limited," says Benjamin Kanter, chief medical information officer at Palomar Health in San Diego. "For a long time, we've had the challenge of just getting information into the system. Now the system is starting to actually help me."

One big advance is the avatar itself: Molly can modulate her tone of voice and facial expressions, which are important in helping both patients and doctors to trust the interactions. Sense.ly cofounder Ivana Schnur, a clinical psychologist, says that sometimes patients are more willing to share sensitive information with a nonjudgmental avatar than with a doctor. Eventually, Schnur hopes, the system will be able to interpret and respond to a patient's facial expressions, which means it could be used in even more complex roles.

Global Warming Demands a Smarter Pollution Crackdown

Cleaning up power plants could be counterproductive unless diesel soot is reduced too.

By Kevin Bullis

Cutting our use of fossil fuels has proved a daunting challenge, but it might be possible to get relief from the effects of climate change by more aggressively reducing pollution from certain particulates—the ones that actually serve to warm rather than cool the planet.

A new study from the Scripps Institution of Oceanography concludes that if every country were to do what California has done in the last couple of decades to reduce the black carbon soot from diesel emissions, it would slow global warming by 15 percent. Reducing similar pollution from sources such as ships and cookstoves—which weren't included in the study—could help even more.

Aerosol pollutants such as sulfur dioxide, soot, and ozone are all bad for human health, but they have different

effects on the climate. For example, sulfates that form from coal-plant exhaust reflect sunlight back into space, acting to shade the planet and cool it off. Black-carbon particles from diesel exhaust, on the other hand, absorb sunlight and heat up, warming the atmosphere. "When you add them together, we think that on balance they're cooling the planet," says Phil Rasch, a fellow at the Pacific Northwest National Laboratory. "If we could get rid of the ones that are warming the planet, then that would buy us some more time."

One advantage of going after black carbon is that these pollutants fall out of the atmosphere in a few days or weeks, so once emissions stop, the air quickly clears. Carbon dioxide stays in the atmosphere for hundreds of years.

Of course, it's ultimately important to reduce all pollution, since it kills millions of people a year. Selectively reducing pollutants "is an important strategy we can think about," says Lai-yung Ruby Leung, another fellow at the national lab, "but it needs to be carefully done."

Reducing soot from vehicles could pay off more than other pollution-reduction tactics when it comes to addressing global warming.



Senator WHITEHOUSE. So again, my thanks for the wonderful way the two of you are working together.

Senator CARPER. Thanks very much, without objection, we will be happy to do that. That is a publication that comes to our house every month. My wife says, why do they send us this? I said, we had a son that went to school there. And I said, Martha, we have paid for this subscription more times than you can count.

[Laughter.]

Senator CARPER. All right. One of our colleagues who is not with us today, he would like to talk about the 80-20 rule and explain how he had great success for many years when Ted Kennedy was with us. Our colleague is a very conservative Republican from out west and was able to work with a pretty liberal Democrat. I said, what is the key to your success? He always said, it is the 80-20 rule. And I said, what is that? He said, Senator Kennedy and I agree on 80 percent of the stuff, we disagree on the other 20 percent of what we try to do is focus on the 80 percent where we agree, to see what we can get done. This is just a great example of the 80-20 rule.

And my staff reminded me, and I want to thank our staffs, Democrat and Republican staff, reminded me that for every \$3 that we invest in DERA, in those funds, for every dollar, excuse me, that we invest in DERA, we get a \$3 leverage from State funds, local funds, private funds. So it is a great way to leverage additional moneys on a three to one basis.

The last thing I would say before we recognize our panel, is a question that I ask of all of us from time to time, is it possible to clean our environment, clean our air and create jobs at the same time. And we will hear from Mr. Johnson and probably others on this panel, we will probably get the answer, and the answer is very encouraging: yes.

So our panel today, Conrad Schneider, very nice to see you again. Welcome, thanks for joining us. You are the Advocacy Director at the Clean Air Task Force. Thank you very much.

Next is Timothy V. Johnson, Tim Johnson. Tim Johnson is a popular name here, you know, with one of our colleagues from South Dakota. This Tim Johnson, though, is the Director of Emerging Technologies and Regulations at the Corning Environmental Technologies, Corning, Inc.

Next we have Mr. Allen Schaeffer. Mr. Schaeffer, nice to see you. He serves as the Executive Director of the Diesel Technology Forum. Thanks so much.

And next Bob Singletary, an attorney at the Oklahoma Department of Environmental Quality.

And finally, Robert C. Harris, Jr. He is the Vice President of Environmental and Program Management at the Alabama State Port Authority. It is great to see you.

I would ask you to keep your statements to about 5 minutes. If you go way over that, we will rein you back. Otherwise, you will be good to go. So thank you all for joining us. Your whole statements will be made part of the record, and we look forward to hearing from you and having a good conversation.

Mr. Conrad Schneider.

**STATEMENT OF CONRAD G. SCHNEIDER, ADVOCACY
DIRECTOR, CLEAN AIR TASK FORCE**

Mr. SCHNEIDER. Thank you, Senator Carper, Ranking Member Sessions and other members of the Subcommittee. Good morning.

My name is Conrad Schneider, Advocacy Director of the Clean Air Task Force. I very much appreciate the opportunity to speak to you today. We are an advocacy group really focused on clean air and climate issues.

I would like to talk about the public health and environmental threats posed by black carbon emissions and two cost-effective ways that the Federal Government can reduce them. First, fully fund the Diesel Emission Reduction Act, DERA. And second, enact Senator Carper's Clean Construction Act as part of the next Transportation Reauthorization Bill.

DERA, as we have heard, is a highly successful program and enjoys broad bipartisan support. Clean Construction, which has been endorsed in principle by my organization and the Associated General Contractors, provides a unique opportunity to integrate and streamline clean air measures into project delivery while providing support for contractors to clean up dirty equipment and protect public health.

Diesel engines are known for their durability. But older engines emit a toxic mixture of tiny black carbon soot particles and gases from the burning of diesel fuel and lubricating oil that go from the end of the tailpipe directly to your lungs. At highest risks are commuters and people living or working in proximity to truck traffic, construction or other heavy equipment.

Nationally, diesel exhaust poses a cancer risk that is three times higher than the risk from all other air toxics tracked by EPA combined. Premature death, lung cancer, heart attack and stroke have all been tied to diesel pollution. Estimates show that for every dollar spent on reducing black carbon and the other components of diesel exhaust, \$13 would be avoided in health damages.

Moreover, black carbon is a potent global warming agent. It warms the atmosphere by absorbing sunlight and radiating heat into the air, much like an asphalt parking lot on a summer day. Black carbon can darken snow and ice directly, accelerating melting. It is about 2,000 times more potent than the equivalent amount of carbon dioxide over a 20-year period, and the United States has the highest per capita emissions in the world for black carbon, 57 percent of which comes from diesels.

Retrofitting these engines with filters and/or accelerating the turnover to new cleaner engines equipped with filters offers one of the few actions that will have immediate climate benefits, complementing long-term efforts to reduce CO₂ emissions. In fact, diesel particulate filters are the only emission control technology that can virtually eliminate black carbon particles from diesel exhaust, with over a 90 percent effectiveness.

While EPA has mandated tighter emissions rules on new diesel engines, most of the 11 million heavy duty engines in use today lack these filters. Unfortunately, the rate of fleet turnover to new, cleaner engines slowed during the recession. And more dirty diesels are likely to be with us even longer than we expected. More years and more miles by older engines means more pollution. So we need

to address the pollution from the existing fleet. In 2005, Congress and the Administration enacted DERA, a federally sponsored voluntary grant and loan program to do just that.

Since its inception, EPA estimates that DERA has cleaned up more than 50,000 diesel vehicles, resulting in the reduction of thousands of tons of fine particles, and created over 10,000 jobs. The program was originally authorized at \$200 million per year for 5 years and since that time, over \$500 million has been appropriated, \$300 million through the American Recovery and Reinvestment Act.

Throughout the program's history, DERA has enjoyed strong bipartisan support, most recently demonstrated by its reauthorization for another 5 years in 2010. It was reauthorized at a smaller amount, \$100 million and funded in fiscal years 2009 and 2010 at \$60 million. But the funding has declined every year since, due to the current budgetary situation. The current House and Senate Interior Appropriations bills include less than \$20 million for this program.

We are missing an enormous opportunity for improving public health and the environment by failing to fully fund it. It is backed by a uniquely broad coalition of States and localities, environmental, health, user and industry groups that all support funding because of its sound environmental health and budgetary policy. As Senator Carper said, it is a win-win-win.

We wrote earlier this year asking that Congress fund DERA at not less than \$20 million. It is our hope that Congress will continue to provide leadership on this issue. We urge you to do so.

One sector that has been underserved by DERA and other existing programs is construction. Construction contractors are not always well positioned to take advantage of these programs, which have required a competitive grant application process. There is a better way: clean construction as a part of project delivery in the Transportation bill. Modern pollution control equipment is being used across the country in building projects, originating in the Big Dig and in the Lower Manhattan reconstruction after 9/11, and construction clean contract specifications have been adopted by New York, New York City, Illinois, Rhode Island and most recently by the city of Chicago and in New Jersey.

Taking the lead from these States and working with contractors and the environmental community, you, Senator Carper, crafted the Clean Construction Act of 2011. Provisions included in the Senate version of last year's MAP-21 bill, but unfortunately did not survive in the conference committee and were not included in the final bill as enacted. This is regrettable. This type of program, if included as part of the reauthorization when MAP-21 expires next year, would reduce the amount of harmful black carbon emissions emitted by older construction equipment, working on federally funded transportation projects.

Your approach would accomplish this by ensuring that diesel construction equipment employs modern engine and pollution reduction technology through a requirement in funding, and it is capped at 1 percent of project cost. In MAP-21, we estimated that this would generate \$200 million per year to clean up this construction equipment, and we estimated that the bill would eliminate

9,000 tons of black carbon soot, and avoid nearly 1,000 premature deaths each year.

Thank you for the opportunity to testify in support of these two important opportunities to reduce black carbon emissions.

[The prepared statement of Mr. Schneider follows:]

**BEFORE THE
CLEAN AIR SUBCOMMITTEE OF
THE ENVIRONMENT AND PUBLIC WORKS COMMITTEE
UNITED STATES SENATE**

**BLACK CARBON – A GLOBAL HEALTH PROBLEM
WITH LOW-COST SOLUTIONS**

**TESTIMONY OF CONRAD G. SCHNEIDER
ADVOCACY DIRECTOR, CLEAN AIR TASK FORCE**

September 24, 2013

Summary of Testimony

Mr. Chairman, ranking member Sessions, members of the Clean Air Subcommittee of the Senate Environment and Public Works Committee, good morning. My name is Conrad Schneider, Advocacy Director of the Clean Air Task Force. I appreciate the opportunity to speak to you today. Based in Boston, the Clean Air Task Force is a national non-profit, environmental advocacy organization whose mission includes reducing the adverse health and environmental impacts of diesel engines. Our staff and consultants include scientists, economists, MBA's, engineers, and attorneys dedicated to reducing atmospheric pollution through research, advocacy, and private sector collaboration.

Today I would like to talk about the public health and environmental threats posed by Black Carbon emissions and two cost-effective ways the federal government can reduce the threats posed by black carbon in diesel exhaust: (1) fund the Diesel Emission Reduction Act (DERA); and (2) enact Senator Carper's Clean Construction Act as part of the next Transportation reauthorization bill. DERA is a highly successful program and enjoys broad bi-partisan support. Clean Construction, which has been endorsed in principle by the Clean Air Task Force and Associated General Contractors, provides a unique opportunity to integrate and streamline clean air measures into the project delivery process while providing support for contractors to clean up dirty equipment and protect public health.

The Threats Posed By Diesel Pollution

Fine particle pollution produced by diesel engines, the majority of which is made up of black carbon, causes 21,000 premature deaths a year, according to our 2005 report *Diesel and Health in America: The Lingerin Threat*. While that number has undoubtedly fallen in the intervening years as a result of fleet turnover to new engines meeting EPA's fine particle standards for truck and heavy equipment engines, the rate of turnover was slowed by the recession. That means we still have the opportunity to avoid thousands of preventable deaths by accelerating the replacement of older diesel engines and retrofitting them with emission controls.

Diesel engines are known for their durability, but older engines emit a toxic mixture of particles, metals, and gases, including over 40 "hazardous air pollutants" as classified by EPA. Diesel exhaust is a toxic mixture of tiny black carbon soot particles and gases from the burning of diesel fuel and lubricating oil. These microscopic carbon particles absorb metals and toxic gases in the exhaust and deliver them to your lungs. At highest risk are commuters and people living or working in proximity to truck traffic, construction and other heavy equipment.

Nationally, diesel exhaust poses a cancer risk that is 3 times higher than the risk from all other air toxics tracked by EPA *combined*. Premature death, lung cancer, heart attack, stroke, diabetes, respiratory distress and lost days from school and work have all been tied to diesel pollution, and reducing this risk is a win for everyone. Estimates show that for every dollar spent on reducing black carbon from diesel engines, \$13 would be avoided in health damages.

Moreover, black carbon is a potent global warming agent. Black carbon warms the atmosphere by absorbing sunlight and radiating heat into the air (like a blacktop road). Black carbon can darken snow and ice directly accelerating melting. Black carbon is one of the largest contributing pollutants to global warming. As a warming pollutant, black carbon is about 2000 times more potent than the equivalent amount of CO₂ over a 20-year period. The United States has the highest per-capita emissions in the world for black carbon. 57% of U.S black carbon comes from diesels; 41% from on-road diesels and another 16% from off-road diesels.

In January 2013, a team of 31 world-renown experts released *Bounding the role of black carbon in the climate system: A scientific assessment*. This comprehensive assessment confirmed the importance of combating global warming by reducing black carbon from targeted pollution sources and concluded that black carbon is the second-most-damaging greenhouse agent after carbon dioxide finding that it is twice as bad for the climate as previously believed.

The study found the measures with highest climate payback to be those that reduced emissions from uncontrolled diesel engines. This is due to the relatively high concentration of black carbon to other pollutants in diesel exhaust. In diesel engines, without a diesel particulate filter (DPF), black carbon accounts for about 50 to 80 percent of diesel particles emitted. Diesel engine emissions, especially emissions from engines without DPFs, have been specifically identified in other studies as well as a significant driver of short-term climate change. Retrofitting diesel engines with filters and accelerating the turnover of the diesel fleet to new engines equipped with filters offers one of the few actions that will have immediate climate benefits, complementing long-term efforts to reduce CO₂ emissions.

The Solution to Diesel Black Carbon Pollution: The Diesel Particulate Filter

Diesel particulate filters (DPFs) are the only emissions control technology that can virtually eliminate black carbon particles with a 90+ percent effectiveness. Installing a diesel particulate filter on a Class 8 truck (e.g. tractor-trailer truck) provides the equivalent climate benefits to eliminating the carbon dioxide emissions of 6 passenger cars.

The Diesel Emissions Reduction Act

While the U.S. EPA has mandated tighter emissions rules on new diesel engines, emissions from most of the current fleet of 11 million heavy-duty diesel engines remain uncontrolled. CATF's diesel advocacy focuses on cleaning up this existing fleet of diesel engines, which are expected to remain in operation for decades to come. Unfortunately, the rate of turnover of the fleet to new, cleaner engines slowed during the recession as sales of new diesels plummeted. As a result, older, dirtier diesels likely will be with us for even longer than expected. More years and more miles by older, dirtier trucks will mean more pollution, so we need to deal with pollution from the existing fleet.

In 2005, Congress and the Administration sought to provide states and localities with new tools for meeting National Ambient Air Quality Standards (NAAQS) and reducing human exposure to harmful diesel emissions. Passed with overwhelming support from government, industry and environmental organizations as part of the Energy Policy Act of 2005, the Diesel Emissions Reduction Act (DERA) established a federally sponsored voluntary retrofit initiative to reduce emissions generated by America's aging diesel fleet.

The program was originally authorized for \$200 million/year for 5 years or \$1 billion. Since that time, over \$500 million has been appropriated to the Diesel Emissions Reduction Program (DERP), \$300 million through the American Recovery and Reinvestment Act. Throughout the program's history, DERA has enjoyed strong bipartisan support most recently demonstrated in December 2010 when Congress took the extraordinary step of reauthorizing DERA during the "lame duck" session. The reauthorization bill authorized funding at the level of \$100 million and the program was funded in FY09 and FY10 at \$60 million and \$50 million in FY11. Unfortunately, funding in FY12 and 13 declined to \$30 million and \$20 million, respectively, as a sign of the current budgetary situation. The current House and Senate Interior appropriations bills include even less. We are missing an enormous opportunity for improving public health and the environment by failing to fully fund DERA.

Since its inception, EPA estimates that DERA has cleaned up more than 50,000 diesel vehicles, resulted in the reduction of thousands of tons of fine particles and black carbon, and created over 10,000 jobs.

DERA is backed by a uniquely broad coalition of environmental, science-based, public health, industry, labor and state and local government groups. States and localities and environmental, health, user and industry groups all support funding for diesel retrofits and clean air agencies because it is sound environmental, health and budgetary policy. It is our hope that Congress will continue to provide leadership on this issue and we urge you to support greater funding for DERA this year. However, CATF believes that this funding should not come at the expense of other priorities within EPA's budget, which is already strained to the limit.

Clean Construction in the Transportation Bill

One sector that has been underserved by DERA and other existing programs is Construction. Construction contractors are not always well-positioned to take advantage of these programs, which have required a competitive grant application process. There is a better way: Clean Construction as part of project delivery in the Transportation Bill.

Modern pollution control equipment is being used across the country in building clean transportation projects to ensure that no harm is done to the air quality in communities during infrastructure projects. Originating with the “Big Dig” and the Lower Manhattan Reconstruction after 9/11, today Clean Construction contract specifications have been adopted by New York City and New York State, Illinois and Rhode Island, and most recently by the City of Chicago and by Governor Christie in New Jersey.

Taking the lead from these states and working with the contractors and environmental community, Senator Carper crafted the Clean Construction Act of 2011, introduced in the 112th Congress. Clean Construction provisions were included in the Senate version of last year’s MAP-21 Transportation Bill reauthorization, but unfortunately did not survive the Committee of Conference and were not included in the final version of MAP-21 as enacted.

That is regrettable. This type of program if enacted as part of the reauthorization when MAP-21 expires next year, would reduce the amount of harmful black carbon emissions emitted by older diesel on- and off-road construction equipment working on federally-funded transportation infrastructure projects located in areas with poor air quality. The Carper approach would accomplish this by ensuring that diesel construction equipment employs modern engine and pollution reduction technology through a requirement and funding.

Specifically, it would provide funding to retrofit, repower and upgrade equipment to provide the maximum achievable reduction of diesel particulate emissions as an eligible project expense. The bill would achieve this through a funded requirement for the installation of emission control technology in PM2.5 designated non-attainment and maintenance areas an eligible project expense through a change order, a process that both State DOT’s and contractors are familiar with and utilize. The goal is to streamline a process that integrates clean air benefits into project delivery.

To maintain strict cost controls, the bill required that no more than one percent of a transportation project’s cost must be used by States to upgrade dirty equipment. In MAP-21, the program was expected to allocate approximately \$200 million per year for clean equipment. CATF estimates that the bill will

eliminate 9,000 tons of soot emissions and avoid nearly 1,000 premature deaths and other adverse health effects.

As a policy roadmap, the Clean Air Task Force (CATF) and the Associated General Contractors (AGC) distilled a set of Clean Construction Principles based on our experiences with state efforts that are embodied in the Clean Construction Act of 2011. Both our organizations endorsed the bill when it was introduced.

Thank you for the opportunity to testify in support of two important federal policies that can help reduce the threats posed by black carbon pollution. I look forward to working with the subcommittee in securing funding for DERA and including Clean Construction in our nation's next Transportation Reauthorization Bill.

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Mr. Chairman, ranking member Sessions, members of the Clean Air Subcommittee of the Senate Environment and Public Works Committee, good morning. My name is Conrad Schneider, Advocacy Director of the Clean Air Task Force. I appreciate the opportunity to speak to you today. Based in Boston, the Clean Air Task Force is a national non-profit, environmental advocacy organization whose mission includes reducing the adverse health and environmental impacts of diesel engines. Our staff and consultants include scientists, economists, MBA's, engineers, and attorneys dedicated to reducing atmospheric pollution through research, advocacy, and private sector collaboration.

Today I would like to talk about the public health and environmental threats posed by Black Carbon emissions and two cost-effective ways the federal government can reduce the threats posed by black carbon in diesel exhaust: (1) fund the Diesel Emission Reduction Act (DERA); and (2) enact Senator Carper's Clean Construction Act as part of the next Transportation reauthorization bill. DERA is a successful program and enjoys broad bi-partisan support. Clean Construction, which has been endorsed in principle by the Clean Air Task Force and Associated General Contractors, provides a unique opportunity to integrate and streamline clean air measures into the project delivery process while providing support for contractors to clean up dirty equipment and protect public health. We believe that devoting up to one percent of the cost of transportation projects to clean air is not too much to help protect the health of our citizens.

1. The Risk Posed by Diesel Exhaust

Black carbon soot produced by diesel engines causes 21,000 deaths a year, according to our 2005 report *Diesel and Health in America: The Lingerin Threat*. While that number has undoubtedly fallen in the intervening years as a result of fleet turnover to new engines meeting EPA's fine particle standards for new trucks and heavy equipment engines, the rate of turnover was slowed by the recession. We still have the opportunity to avoid thousands of preventable deaths by accelerating the replacement of older diesel engines and retrofitting them with emission controls.

Diesel engines are known for their durability, but older engines emit a toxic mixture of particles, metals, and gases, including over 40 "hazardous air pollutants" as classified by EPA. Diesel exhaust is a toxic mixture of tiny carbon soot particles and gases from the burning of diesel fuel and lubricating oil. These microscopic carbon soot particles absorb metals and toxic gases in the exhaust and deliver them to your lungs. At highest risk are commuters and people living or working in proximity to truck traffic, construction and other heavy equipment.

Nationally, diesel exhaust poses a cancer risk that is 3 times higher than the risk from all other air toxics tracked by EPA *combined*. Premature death, lung cancer, heart attack, stroke, diabetes, respiratory distress and lost days from school and

work have all been tied to diesel pollution, and reducing this risk is a win for everyone. Estimates show that for every dollar spent on reducing particulate matter pollution from diesel engines, \$13 would be avoided in health damages. Moreover, as a global warming pollutant, black carbon in diesel pollution is about 2000 times more potent than carbon dioxide (CO₂). Diesels account for over half of the US black carbon emissions. Retrofitting diesel engines with filters and accelerating the turnover of the fleet to new engines equipped with filters offers one of the few actions that will have immediate climate benefits, complementing long-term efforts to reduce CO₂ emissions.

What is Diesel Exhaust?

Diesel exhaust is a toxic mixture of tiny fine and ultrafine carbon soot particles and gases from the burning of diesel fuel and lubricating oil. These microscopic carbon soot particles absorb metals and toxic gases in the exhaust and deliver them to your lungs. At highest risk are commuters and people living or working in proximity to truck traffic, construction and other heavy equipment.

Diesel Pollution Kills

Using EPA's approved methodology, my organization has estimated that diesel particulate matter soot kills an estimated 21,000 Americans every year.¹ Medical researchers are just beginning to understand how combustion particles can cause fatal diseases such as cancer, stroke, and heart attacks. When inhaled, these tiny, poison-laden particles may be capable of directly triggering a response from the cardiovascular system or crossing the blood-barrier from lungs into the bloodstream, delivering them to internal organs.

- Exposure to particles is a well-known cause of premature death as documented in the two largest long-term air pollution studies ever conducted, the Harvard Six Cities Study and the 150-city American Cancer Society study.²
- The 90-city National Morbidity and Mortality Air Pollution Study associated daily exposures of particles with premature death.³

Heart Disease

The largest fraction of particulate matter-related premature deaths in the U.S. are believed to be from heart disease. Doctors have long known the relationship of inflammation and heart disease and particles may have a fatal inflammatory effect on the heart. Other factors include atherosclerosis (hardening of the arteries) and cardiac arrhythmias that may be precursors to sudden death or stroke. Research also suggests that particles have the ability to directly alter heart rate function and cause myocardial infarction or "MI"—a potentially fatal blockage of blood supply to the heart.

- A 2007 Harvard study of 54,000 workers in the trucking industry found a higher risk in heart disease in the trucking industry compared to the general U.S. population: a 49 % higher risk in drivers, a 32% higher risk in dock workers, and a 34% higher risk in shop workers.⁴
- A 2004 study of highway patrolmen exposed over a shift, particulate matter was linked to irregular heartbeats and increases in blood inflammatory markers.⁵
- A 2004 study found that heavy equipment operators exposed to diesel exhaust have a 47 percent increased risk of death due to ischemic heart disease (congestive heart failure/heart attacks).⁶
- Researchers documented a 24% increase in risk of women having a cardiovascular event and an overall 76% increase in risk of death from cardiovascular disease for each 10 ug/m3 of PM2.5 in the ambient air. Within-city risks were higher than the risk between cities suggesting the importance of local sources of particles, such as diesel vehicles.⁷
- Ultrafine particles in fresh diesel exhaust (tiny particles under 0.1 microns in size), can lead to systemic acute inflammation and exacerbation of cardiovascular disease and atherosclerosis according to recent studies.^{8,9}
- A 2007 study of 700 heart attack survivors shows that they were most likely to have been in heavy traffic the hour before they suffered the heart attack, whether in cars, streetcars or buses.¹⁰ Studies find that traffic-related health risks are better correlated to truck rather than car volume and therefore may be more strongly related to diesel engine exhaust.
- A link between exposure to particles and vascular inflammation/atherosclerosis is suggested by animal studies and could explain how particles are linked to heart attacks.¹¹

Cancer

Researchers repeatedly find associations between exposure to diesel exhaust and cancers. Approximately three-dozen occupational studies conducted over the past three decades link diesel exhaust exposure to lung cancer, posing an increased cancer mortality risk of 10-40%. In the laboratory, scientists have observed DNA damage and cell mutations that could be an indicator of the ability of particles to trigger cancer.

Based on EPA's 2005 National Air Toxic Assessment released in 2011, CATF estimates that the lung cancer risk from particles is approximately three times the combined risk of the 80 air toxics modeled by EPA.

- Over 30 epidemiological studies link diesel particulate matter to lung cancers.^{12,13,14,15,16,17,18}
- Risk of lung cancer death was linked to fine particles in a study that tracked a million people over a decade and a half in 150 U.S. metropolitan areas¹⁹
- Diesel soot is identified as a carcinogen U.S. EPA, the State of California and the International Agency for Research on Cancer (IARC).^{20,21,22} Other compounds in diesel exhaust, other than soot are also known carcinogens

- such as polycyclic aromatic hydrocarbons, and formaldehyde.
- Operators of heavy machines in ground and road construction exposed to diesel exhaust are at risk of death from cancers of the digestive system, intestines, lung, liver, bladder and stomach.²³
- CATF estimates that, based on EPA's 2005 NATA data released in 2011, the lung cancer risk from exposure to diesel particles is 159 times greater than the EPA's "acceptable" risk of 1 cancer in a million.
- In a study of 55,000 railroad workers over 38 years, Harvard researchers found an overall 40% increased risk of lung cancer for workers in 30 job categories.^{24,25}
- The NIOSH Teamsters (truckers) study concluded that the lifetime excess risk for truckers was 10 times higher than the 1/1000 excess risk allowed by OSHA in occupational settings.²⁶
- A 2007 Harvard study of 54,000 truckers from 1985-2000 found a 10 % higher risk for lung cancer in drivers and dock workers compared to the general U.S. population.
- Recent studies link particulate matter exposure to DNA damage.²⁷

Respiratory Health Impacts

Researchers have long associated diesel exhaust, particulate matter and traffic with reduced lung function and lung growth, asthma attacks, asthma sensitization, and in one study, emphysema.

- Multiple studies link asthma and allergic sensitization and particles.^{28, 29,30,31,32,33} An East Bronx NY study suggests children exposed to higher levels of heavy-duty diesel exhaust have higher incidences of asthma.³⁴
- A 2009 field study found that short-term exposure of asthmatics to urban roadside diesel traffic led to consistent and significant reductions in lung function, airway acidification and inflammation. A study from the Netherlands links asthma diagnosed before 1 year of age to traffic.³⁵ In a California study, asthma and bronchitis was found to be 7 percent higher among children attending school in high-traffic areas, compared with schools along quieter streets.³⁶
- Heavy equipment operators exposed to diesel exhaust have a significantly elevated risk of death from emphysema.³⁷
- Deficits in lung function growth were found in southern California 18 year olds exposed to PM2.5 and black carbon.³⁸ The number of children with lung function deficits was 5 times greater in communities with the highest levels of PM2.5 compared to communities with the lowest levels of PM2.5.

Exposure to diesel exhaust, and proximity to traffic poses a risk of other serious disease including stroke, diabetes, slowed fetal growth, infant mortality and possibly autism.

- Diabetes: A 2010 study links particulate matter air pollution to diabetes in the U.S. (<http://care.diabetesjournals.org/content/33/10/2196>). The study found

that counties with higher levels of particulate matter had increased prevalence of diabetes, even where counties were in attainment with the EPA's National Ambient Air Quality Standard for fine particles (PM_{2.5}). Elevated circulatory and cardiovascular disease risk was found in another study based on 24-hour exposures to particles.³⁹

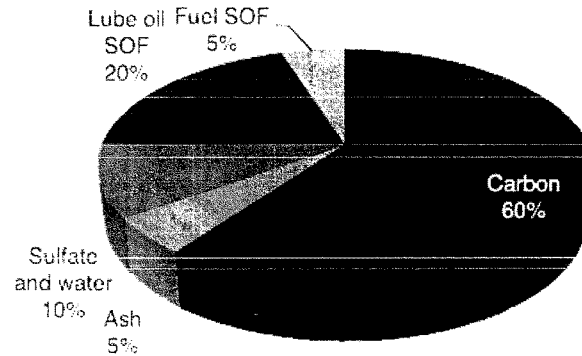
- Nervous system impairment. A study of railroad workers exposed to diesel exhaust concluded: "crews may be unable to operate trains safely."⁴⁰
- Stroke. Diesel exhaust particles may raise the risk of blood clots and stroke.⁴¹ Risk more than doubled within 2 hours of exposure to high levels of fine particles in a Japanese study.⁴² Formation of blood clots (thromboses), have been documented in laboratory animals exposed to diesel particles.⁴³
- Autism. A 2010 study correlates prenatal freeway traffic proximity in California and incidence of autism. The risk of autism is nearly double (86% increase) inside 1,000 feet. Diesel exhaust could be a risk factor.⁴⁴
- Slowed fetal growth as a result of maternal exposure during pregnancy⁴⁵ and infant mortality.^{46, 47}

Climate Change

Black carbon warms the atmosphere by absorbing sunlight and radiating heat into the air (like a blacktop road). Black carbon can darken snow and ice, and directly accelerate melting.⁴⁸ Black carbon is one of the largest contributing pollutants to global warming.^{49 50} As a warming pollutant, black carbon is about 2000 times more potent than the equivalent amount of CO₂ over a 20-year period.⁵¹ The United States has the highest per-capita emissions in the world for black carbon.⁵² 57% of U.S black carbon comes from diesels; 41% from on-road diesels and another 16% from off-road diesels.⁵³

In January 2013, a team of 31 world-wide experts released *Bounding the role of black carbon in the climate system: A scientific assessment* (Bond, et. al. 2013).⁵⁴ This comprehensive assessment confirmed the importance of combating global warming by reducing black carbon from targeted pollution sources and concluded that black carbon is the second-most-damaging greenhouse agent after carbon dioxide, by finding that it is twice as bad for the climate as previously believed. It derived a best estimate of total radiative forcing in the industrial period – accounting for all forcing pathways including interaction with clouds and on the cryosphere – of +1.1 Wm⁻² with a 90 percent uncertainty. This is 0.88 °C or two-thirds of the warming to date from CO₂.

The study found the measures with highest climate payback to be those that reduced emissions from uncontrolled diesel engines. This is due to the relatively high concentration of black carbon to other pollutants from uncontrolled diesel. In diesel engines, without a diesel particulate filter (DPF), black carbon accounts for about 50 to 80 percent of diesel particles emitted.



Composition of PM mass emissions from a conventional heavy-duty diesel engine without a particle filter. SOF stands for soluble organic fraction (CARB, 2011)⁵⁵

Diesel engine emissions, especially emissions from engines without DPFs, have been specifically identified in other studies as well as a significant driver of short-term climate change⁶⁶ (Jacobson, 2010, Tanaka et al, 2012, US EPA, 2012).

2. The Solution to Diesel Black Carbon Pollution: The Diesel Particulate Filter

Diesel particulate filters (DPFs) are the only retrofit technology that can virtually eliminate black carbon particles (90+ percent effectiveness).⁵⁷ Retrofitting diesel engines with filters is one of the few actions that will have immediate climate benefits, complementing long-term efforts to reduce CO₂ emissions.⁵⁸ Despite clean diesel regulations for new engines there are 11 million old diesels in the U.S. that may be in use for decades and should be retrofit with the same filter technology required under U.S. EPA rules for new on-road and off-road diesels.⁵⁹ Installing a diesel particulate filter on a Class 8 truck (e.g. tractor-trailer truck) provides the same climate benefits as eliminating the carbon dioxide emissions of 6 passenger cars.⁶⁰

A. Diesel Emissions Reduction Act (DERA)

CATF's diesel advocacy focuses on cleaning up this existing fleet of diesel engines, which are expected to remain in operation for decades to come. The rate of turnover of the fleet to new, cleaner engines has been slowed during the recession as sales of new diesels plummeted. As a result, older, dirtier diesels will be with us for even longer than expected. More years and more miles by

older, dirtier trucks will mean more pollution, so we need tools to deal with pollution from the existing fleet.

In 2005, Congress and the Administration sought to provide states and localities with new tools for meeting National Ambient Air Quality Standards (NAAQS) and reducing human exposure to harmful diesel emissions. Passed with overwhelming support from government, industry and environmental organizations as part of the Energy Policy Act of 2005, the Diesel Emissions Reduction Act (DERA) established a federally sponsored voluntary retrofit initiative to reduce emissions generated by America's aging diesel fleet.

The program was originally authorized for \$200 million/year for 5 years or \$1 billion. Since that time, over \$500 million has been appropriated to the Diesel Emissions Reduction Program (DERP), \$300 million through the American Recovery and Reinvestment Act. Throughout the program's history, DERA has enjoyed strong bipartisan support most recently demonstrated in December 2010 when Congress took the extraordinary step of reauthorizing DERA during the "lame duck" session. The reauthorization bill authorized funding at the level of \$100 million and the program was funded in FY09 and FY10 at \$60 million and \$50 million in FY11. Unfortunately, funding in FY12 and 13 declined to \$30 million and \$20 million, respectively, as a sign of the current budgetary situation. The current House and Senate Interior appropriations bills include even less. We are missing an enormous opportunity for improving public health and the environment by failing to fully fund DERA.

DERA is now authorized from FY2012 through FY2016 at \$100M per year. It authorizes the use of grant, rebates and loans to achieve significant reductions in diesel emissions and improves upon the original authorization by focusing the program on the most beneficial solutions and streamlining implementation. The program now also makes it easier for EPA to leverage DERA funds through loans and by soliciting larger project proposals. DERA provides that 70 percent of funds are distributed by EPA (with 5% for emerging technologies); allocates 30 percent of funds to states and but will now require that only EPA or CARB verified and certified technologies be funded. DERA includes an incentive for states to partially match federal funding to increase overall size of funds and now requires that EPA give the highest priority to projects that meet the Congressional established criteria for ranking and evaluating projects, which emphasize cost-effectiveness and health benefits.

Since its enactment, the Diesel Emissions Reduction Act (DERA) has been successful in addressing the problem of diesel emissions from an economic, environmental and public health perspective. The DERA program has been responsible for the creation and retention of local U.S. jobs that involve manufacturing, installation and servicing of emissions related technologies. In its statutorily mandated report to Congress on the performance of the FY2008 program, EPA estimated that for every dollar spent on the DERA program, an

average of more than \$13 in health benefits are generated. The program is oversubscribed; EPA has received as much as \$5 in applications for every \$1 appropriated for awards. EPA found that for that one fiscal year DERA had funded 119 projects affecting more than 14,000 diesel-powered vehicles/equipment across the country. It created new state clean diesel grant programs in all 50 states and attracted \$61.4 million in matching funds. That first-year investment resulted in the elimination of 46,000 tons of NOx and 2,200 tons of PM emissions. EPA estimated that this resulted in \$580 million to \$1.4 billion in public health benefits. In addition, fuel saving measures resulted in 464,400 tons of CO2 emission reductions, which meant 3.2 million gallons of fuel saved per year for a cost savings of more than \$8 million per year. The federal investment in DERA that year generated more than \$61M in matching or leveraged funds. Since its inception, EPA estimates that DERA has cleaned up more than 50,000 diesel vehicles, resulted in the reduction of thousands of tons of fine particles and black carbon, and created over 10,000 jobs.

As part of the American Recovery and Reinvestment Act (ARRA), DERA was funded at the \$300 million level. EPA received more than 600 applications amounting to \$2 billion in project proposal requests were received in 2008 and more than \$2 billion in matching funds offered. Nearly 400 applications were received in 2009 for the \$84 million available in FY2009 and FY2010 (not including \$36 million for state programs). Approximately \$570 million in funding was requested and more than \$1 billion in matching funds offered. EPA estimates that more than \$1 billion in qualified unfunded project proposals were received.

DERA is backed by a uniquely broad coalition of environmental, science-based, public health, industry, labor and state and local government groups. States and localities and environmental, health, user and industry groups all support funding for diesel retrofits and clean air agencies because it is sound environmental, health and budgetary policy. It is our hope that Congress will continue to provide leadership on this issue and we urge you to support greater funding for DERA this year. However, CATF believes that this funding should not come at the expense of other priorities within EPA's budget, which is already strained to the limit.

B. Clean Construction in the Transportation Bill

One sector that has been underserved by DERA and other existing programs (like the Congestion Mitigation Air Quality program under the current Transportation Bill) is Construction. Construction contractors are not always well positioned to take advantage of these programs, which have required a competitive grant application process. There is a better way: Clean Construction.

What is Clean Construction?

Taking the lead from several states and municipalities around the country that have adopted Clean Construction specifications and working with the contractors and the environmental community, in the last Congress, Senator Carper along with six original co-sponsors introduced the Clean Construction Act, designed to reduce the amount of harmful particulate matter emissions emitted by older diesel on- and off-road construction vehicles working on federally-funded transportation infrastructure projects located in areas with poor air quality. Under the bill's approach, this would be accomplished by ensuring that diesel construction equipment employs modern engine and pollution reduction technology through a requirement and funding. As a policy roadmap, the Clean Air Task Force (CATF) and the Associated General Contractors (AGC) negotiated a set of Clean Construction Principles that are embodied in the Clean Construction Act.

The bill spelled out a process for cleaning up construction equipment and vehicles used on a federally funded transportation infrastructure projects located in PM2.5 designated non-attainment and maintenance areas. These engines can be retrofitted cost effectively with best available emission control technologies that can reduce harmful emissions of PM2.5 by up to 85 percent and black carbon by more than 90 percent.

The funding to purchase and install the emission control technology would come directly from the project costs as an eligible project expense through the change order process. The cost of the diesel emissions control technologies is capped at no more than one percent of project cost.

Why We Need Clean Construction

The Clean Air Act Advisory Committee (CAAAC) estimates that over 37 percent of land-based particulate matter comes from construction equipment.⁶¹ Nationwide, there are over 2 million pieces of construction equipment and most lack modern particulate pollution controls. Pollution from diesel equipment has the potential to affect citizens in all parts of the country. Over 88 million Americans live in counties that violate federal health standards for particulate pollution.

The equipment that would utilize emission control technology are strong, well-built machines that last upwards of thirty years. While recognizing the important function and the positive work these vehicles provide to owners and communities alike, technology is available to make these vehicles cleaner and the communities in which they operate healthier.

Technology is Available

Fortunately, affordable emission control technology is available to address emissions from construction equipment. This technology is feasible to install and installation is accessible throughout the country. The U.S. EPA estimates that retrofitting 10,000 engines would eliminate roughly 15 000 tons of harmful pollution each year. Achieving emissions reductions from in-use diesels is needed because older engines pollute at much higher rates than newer ones and remain on the road for decades. The U.S. EPA believes that in-use diesel emission control programs can help states meet their immediate nonattainment goals and other Clean Air Act requirements such as conformity, as well as address ongoing public complaints and concerns about dirty diesels.

There are currently several available emission control technologies that address the emission challenges facing on- and off- road construction equipment. These technologies include: retrofitting with Diesel Particulate Filters (DPF), repowering and/or rebuilding older engines, and the use of idle reduction technologies, all of which must be verified by EPA or the California Air Resources Board to ensure their effectiveness. Especially in combination, these technologies can reduce fine particulate matter emissions from construction equipment by 85 percent and black carbon by more than 90 percent.

The tons of PM2.5 reduced by a Clean Construction approach will be available to states to help write the State Implementation Plans (SIPs) to meet National Ambient Air Quality Standards (NAAQS), as credits for transportation conformity, and/or as credits for project conformity at the discretion of the states.

State and Local Clean Construction Initiatives

Modern pollution control equipment is being used across the country to build clean transportation projects to ensure that no harm is done to the air quality in communities during infrastructure projects. Clean Construction was employed on the Big Dig project in Boston as far back as the 1990's, but most notably was used in the reconstruction of lower Manhattan after the 9/11 attacks.

After the success of the lower Manhattan project, the rest of the boroughs of New York wanted Clean Construction and the New York City Council passed Local Law 77, which requires it on all projects in the City. Soon thereafter, the New York Legislature passed the New York Diesel Emissions Reduction Act (NY DERA), which required clean diesel on all state owned fleets and on projects performed by private contractors working for the state.

Meanwhile, in Illinois, Cook County, the county comprising the City of Chicago, adopted an ordinance requiring Clean Construction. The Governor of Illinois followed suit with an Executive Order requiring Clean Construction on all state-

funded projects in nonattainment areas. And, the Chicago City Council unanimously passed a Clean Construction ordinance for the City. In 2010, Rhode Island, following action by the City of Providence, passed legislation with the support of the contractors requiring Clean Construction. Governor Christie of New Jersey issued an Executive Order requiring Clean Construction.

History of Diesel Retrofits in the Transportation Bill

During the Reauthorization of SAFETEA-LU, a significant effort was made to include Diesel Retrofits as a priority in the Congestion Mitigation Air Quality (CMAQ) program. Securing the CMAQ priority language was successful, but the implementation of this policy was less so.

Without clear guidance, states were reluctant to utilize the diesel retrofit language. Contractors who were in most need of the funding for retrofits found the process of going through CMAQ cumbersome. In short, the CMAQ priority language did not accomplish what it had set out to do: provide a resource for contractors and states to utilize emission control technology in the areas with the most impacted air quality.

While the Clean Construction approach was adopted as part of the Senate's version of last year's MAP-21 Transportation Bill reauthorization, it did not survive the Committee of Conference and was not included in the most recent two-year Transportation Bill (MAP-21) as enacted.

A New Opportunity

We recommend that in reauthorizing MAP-21 next year, Congress adopt the approach embodied in the Clean Construction Act of 2011 and the Senate version of MAP-21. This approach would require that federally funded transportation projects in non-attainment areas phase in the use of clean construction equipment – such as front-end loaders, diggers, and earthmovers. Senator Carper's bill would provide funding to retrofit, repower and upgrade equipment to provide the maximum achievable reduction of diesel particulate emissions as an eligible project expense.

Senator Carper's approach would achieve this through a funded requirement for emission control technology in PM2.5 designated non-attainment and maintenance areas an eligible project expense through a change order, a process that both State DOT's and contractors are familiar with and utilize. The goal is to streamline a process that integrates clean air benefits into project delivery.

Also important with respect to the competitive bid process is that contract awards should be blind to whether a firm already has clean construction equipment in its

fleet. This will ensure that smaller firms that have not invested in retrofits are not shut out of the bidding for projects, thereby making sure that some of the dirtiest equipment in service is eligible for clean up.

To maintain strict cost controls, Senator Carper's bill required that no more than one percent of a transportation project's cost must be used by States to upgrade dirty equipment. We have commissioned case studies on ten projects, five that have been completed utilizing Clean Construction and five that have projected the use of Clean Construction on projects. The results have consistently shown that project equipment can be cleaned up for no more than one to one and one-half percent of project cost. This provision is expected to allocate approximately \$200 million per year for clean equipment. CATF estimates that the bill will eliminate 9,000 tons of PM_{2.5} emissions and avoid nearly 1,000 premature deaths plus many more adverse health effects.

Thank you for the opportunity to testify in support of clean diesel in two important federal policies that can help reduce the threats posed by black carbon pollution. I look forward to working with the subcommittee in securing funding for DERA and including Clean Construction in our nation's next Surface Transportation Reauthorization Bill.

¹ Clean Air Task Force, "Diesel and Health in America: The Lingering Threat" (February 2005); see also, Abt Associates, Power Plant Emissions: Particulate Matter-Related Health Damages and the Benefits of Alternative Emission Reduction Scenarios (June 2004).

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- ⁵⁸ Jacobson, M. (2002). Control of fossil-fuel particulate black carbon and organic matter, possibly the most effective method of slowing global warming. Jour. Geophys. Res. V. 1078, p. D19.
- ⁵⁹ See EPA National Clean Diesel Campaign Web site at: <http://ncd.epa.gov/aboutdiesel/>
- ⁶⁰ See CATF Report: The Carbon Dioxide-Equivalent Benefits of Reducing Black Carbon Emissions from U.S. Class 8 Class 8 Trucks Using Diesel Particulate Filters: A Preliminary Analysis. <http://www.catf.us/projects/diesel/>
- ⁶¹ Recommendations for Reducing Emissions from the Legacy Diesel Fleet Report from the Clean Air Act Advisory Committee (April 10, 2006) at p. 48

Senator CARPER. Thank you so much. Thank you for your testimony and for your leadership for eons on these important issues. Mr. Johnson, welcome.

STATEMENT OF TIMOTHY V. JOHNSON, DIRECTOR OF EMERGING TECHNOLOGIES AND REGULATIONS, CORNING ENVIRONMENTAL TECHNOLOGIES, CORNING, INC.

Mr. JOHNSON. Thank you, Mr. Chairman and Mr. Sessions, members of the Senate Environment and Public Works Committee, and also the staffers. We realize the key role that you play here as well. Senator CARPER. We realize that, too.

[Laughter.]

Mr. JOHNSON. I work for Corning, Incorporated. I am a technology scout for the company. It is an honor and pleasure to help you understand the issues around diesel emissions and how remediation is a winning proposition for all stakeholders, and I mean all the stakeholders.

Corning, Incorporated is one of the oldest companies in the world. We date back to 1850. We invest very heavily in R&D, and as a result of that, we have obtained, or were awarded, four Presidential National Medal of Technology Awards, four, in addition to the Malcolm Baldrige Quality Award and many other awards recognizing our relationships with our employees and our community.

I am a recognized expert in diesel emissions and vehicle emissions in general, and keep a keen eye on future developments and openly share my knowledge with industry and government, so we can work together to reduce the harmful environmental impact of vehicles.

My colleague just gave a great overview, and he provided you with a very thorough fact-based assessment in the written testimony. So I won't spend a lot of time on that.

I do have some facts here that you might find surprising. Diesel exhaust is all around us, and is quite toxic. Untreated diesel engines will emit about 10 million to 100 million particles per milliliter. That is the volume in the curved part of my little finger, 100 million particles in that little volume. And each one carries toxic polyaromatic hydrocarbons and other toxic agents deep into your lungs. It is no wonder that the World Health Organization has labeled it as a carcinogen. That is their highest designation and it warrants action.

There are other organizations as well, as reputable, that have declared it as toxins.

This is quite urgent, because we are all exposed. When you drive on the freeway, the air entering your cabin in your car has five times the toxic components of background air. When you take a breath on the order of 1 million to 10 million particles enter your lungs. One breath, 1 million to 10 million. Seventy percent of those are retained.

Effective and inexpensive technologies are available to clean this up. In 2007, the USEPA set limits on diesel pollution for new trucks and engines that resulted in the use of a diesel particulate filter, which my company makes. These amazing devices remove more than 99 percent of these fine particles from the exhaust. In fact, they are so effective that they act like a huge vacuum cleaner.

The air going into the engine has higher concentrations of fine particulates than the gas coming out of the tailpipe.

The more you drive these engines with diesel filters, the cleaner the air gets. Even in pristine Corning, New York, we have a lot of cows there. And this cleans the environment even better.

The technology is a major cornerstone of the emissions control industry, and generates high quality jobs. According to the manufacturers of the Emission Controls Association, in 2012, \$12 billion of economic activity and 65,000 high-paying U.S. jobs were generated in the vehicular emission control industry, and more than \$2 billion of this was from diesel truck controls.

We just announced a new plant in Corning, New York, \$245 million investment, 250 employees and a huge cornerstone, again, to the region of western New York. The plant is intended to build components that will be exported to China, if you can believe that. So it is a significant environmental impact.

DERA, of course, is central to this. Mr. Schneider gave all that justification. Remember, 13 to 1 dollar benefit cost ratio. It is unbelievable.

And one last thing, as Steve Jobs would so effectively say when describing the coolest part of a new product, the filters take out more than 90 percent of the carbon black. This is a proven global warming agent, thousands of times more potent on a pound for pound basis than CO₂. And about 30 percent of the carbon footprint of trucks. So this is a major side benefit that we cannot discount.

I thank you very much for your attention.

[The prepared statement of Mr. Johnson follows:]

Oral Testimony before the Clean Air Subcommittee
of the Environment and Public Works Committee of the US Senate
September 24, 2013

**The Case is Strong, the Technology is Available, and Economic Benefits
are Excellent for DERA Funding of Diesel Particulate Filters for Retrofits**

Timothy V. Johnson
Corning Incorporated

Good morning Mr. Chairman, ranking member Mr. Sessions, and members of the Clean Air Subcommittee of the Senate Environment and Public Works Committee. My name is Timothy V. Johnson, Director of Emerging Regulations and Technology for Corning Environmental Technologies, with Corning Incorporated in Corning, NY. It is an honor and a pleasure to help you understand the issues around diesel emissions and how remediation is a winning proposition for all stakeholders.

Corning Incorporated is one of the oldest companies in the world, dating to the 1850's. We invest heavily in R&D, and design and manufacture cutting-edge glass and ceramics materials that are central to solving problems and advancing a wide range of major products. In this regard, Corning is the recipient of four National Medal of Technology Awards, the Malcom Baldrige National Quality Award, and numerous other awards honoring our inventors and our relationships with the community and employees. I am a recognized expert in the field of vehicle emissions, keep a keen eye on future developments, and openly share my knowledge with the industry and government, so we can work together to reduce the harmful environmental impact of vehicles.

My colleague, Mr. Conrad Schneider, provided you a thorough, fact-based assessment of the health, climate, and societal benefits of diesel emissions. I will touch more on the technology and economic impacts.

Diesel exhaust is all around us, and quite toxic. Untreated diesel engines will emit about 10 to 100 million invisible (to the naked eye) carbon particles per milliliter (the volume of the rounded end of your little finger), and each one carries poly-aromatic hydrocarbons and other toxic agents deep into your lungs. It's no wonder the World Health Organization's (WHO) recently classified diesel engine exhaust as "carcinogenic to humans". This is their most significant toxicity designation, and demands action. Others, like the National Toxicology Program (NTP), US Environmental Protection Agency (EPA), and National Institute for Occupational Safety and Health (NIOSH), also have significant alerts on the toxicity of diesel exhaust. This is quite urgent, because we all are exposed. When you drive on the freeway, the air entering your car cabin contains upwards

of five times the background levels of toxic particulate matter, most of which comes from diesel engines (Health Effects Institute Traffic Review, 2010).

Effective and inexpensive technology is available to clean this up. In 2007, the US EPA set limits on diesel pollution from new truck engines that resulted in the use of Diesel Particulate Filters (DPFs) on all such engines. These amazing devices remove more than 99% of the fine particles. In fact, they are so effective that they act like huge vacuum cleaners, wherein the concentration of fine particles is higher in the air than in the exhaust, even in pristine Corning, NY. The use of filters is not limited to new engines. The same technology can cost-effectively retrofit on legacy engines.

The technology is a major cornerstone of the emissions control industry and generates high-quality jobs. According to the Manufacturers of Emissions Controls Association (MECA), in 2010 \$12 billion of economic activity and 65,000 high-paying US jobs were generated in vehicular emissions controls industry, and more than \$2B of this was from diesel truck controls (MECA press release, March 2011). Much more activity and jobs come from the truck companies and their engineers. Corning developed these filters back in the 1980's. We have just announced a new \$245 million plant investment to make heavy-duty diesel emissions control components in Corning, NY. The plant will directly employ about 250 people at the factory and warehouse. The plant adds to our US capacity for these products, but the much of the product from this new plant will be exported to China and other developing markets.

DERA (Diesel Emissions Reductions Act) is an effective public vehicle for moving forward. Approximately 11 million older diesel engines remain in use today and predate EPA's newest emissions standards. Since 2008, EPA has awarded more than \$500 million to over 500 DERA grants across the country. About 60,000 engines have been fit with filters using government funding. Each government dollar spent on this retrofit technology returns at least \$13 to society, according to EPA analyses. These projects have created up to \$8.2 billion in health benefits, so funding demands for projects remain high even as funding availability levels decrease. Funding requests exceed availability. Six project applications remain unfunded for every one that gets money.

And, "one last thing", as Steven Jobs would say so-effectively when finally disclosing the coolest part of a new Apple product, the filters take out >90% of black carbon. This is a proven global warming agent, thousands of times more potent pound-for-pound than CO₂. In fact, the black carbon emissions from a legacy diesel engine without filters is upwards of 30% of the carbon footprint of medium- and heavy-duty trucks. Reducing these black carbon emissions results in immediate, positive climate impacts.

Senator CARPER. Thank you for great products and for a terrific testimony.

Mr. Schaeffer.

**STATEMENT OF ALLEN SCHAEFFER, EXECUTIVE DIRECTOR,
DIESEL TECHNOLOGY FORUM**

Mr. SCHAEFFER. Good morning, Senator Carper, Senator Sessions and Senator Boozman. Thank you very much for the opportunity to be here.

The Diesel Technology Forum is a not for profit educational group that represents the Nation's leading diesel engine vehicle and equipment manufacturers, fuel refiners and emissions control technology companies as well as allied organizations. We have submitted a detailed written statement for the record today.

I would like to address four points in my oral statement, however. First is to highlight the importance of diesel power to the U.S. economy. Diesel engines are a significant part of the U.S. economy, contributing about \$480 billion annually, and are a dominant feature of 16 key sectors of the economy, from agriculture to wholesale trade.

Diesel engine fuels and technology manufacturing is a job engine in every State, and accounts for about one and a quarter million jobs, engineering, manufacturing and servicing in every State in America. And the technology is not only important to the U.S. economy, but I would also like to highlight its role in the black carbon inventory. While about half of the U.S. economy depends in some way on diesel technology, diesel engines play a declining role in the emissions of black carbon. According to the 2012 EPA black carbon report to Congress, the U.S. accounts for about 8 percent of global black carbon emissions. Of that, 52 percent comes from mobile sources, and 93 percent of that is attributed to diesel engines. Senator Carper, as you stated in your opening remarks, the EPA projects this to decline by 86 percent by 2030, largely due to controls on new engines. In fact, the California Resources Board similarly concludes that by 2014, in 14 short months from today, diesel emissions will make up just 9 percent of all soot in California.

The second point I would like to make is that these major reductions in black carbon emissions are a result of the new generation of clean diesel technology that offers significant fuel savings and emissions reductions and is widely accepted. That is where the largest clean air and climate benefits are being delivered.

The diesel industry has been on a journey of continuous improvement to reduce emissions to near zero levels. Thanks to billions of dollars in investments and the innovation of diesel engine manufacturers and suppliers, we fundamentally transformed diesel engines to a near zero emissions technology. And clean diesel, as we refer to it, is clean engines, advanced fuels and emissions control technologies.

Exhibit 1 to my right outlines that journey for heavy duty on-road commercial trucks and buses, showing particulate matter, of which black carbon is a component and oxides of nitrogen have decreased by 98 percent relative to an engine manufactured in 1988.

As depicted in the next exhibit, not only are these new engines near zero emissions but they are also gaining acceptance in the

trucking industry and delivering tangible clean air benefits today. Based on our research, almost one in three heavy duty trucks on the road today is now of 2007 or newer vintage of clean diesel standards. These engines are found in delivery trucks, buses, fire trucks, short haul and long haul truck and tractor combinations in communities all across America. Their use has already contributed to a reduction of 27,000 tons of particulate matter and almost 1 million tons of nitrogen oxide emissions. While preserving this impressive clean air performance, truck and engine manufacturers are now embarking on another journey, one requiring more investment and innovation to meet requirements to reduce CO₂ emissions and improve fuel economy by somewhere between 6 and 23 percent over the next 6 to 8 years, in compliance with new EPA and NHTSA regulations.

This journey to clean diesel technology is not limited to heavy duty on-road commercial trucks, but has been underway across the board for all diesel engines and applications. As shown in the next exhibit, you can see that diesel engines, which make up two-thirds of all farm and construction equipment, are now in the final phase of their journey for meeting some of the near zero standards for some of the largest earth moving and marine workload kinds of engines. These so-called Tier 4 standards have already been met with the smaller and higher volume off-road engines and equipment.

The third point I would like to make today is on the matter of existing engines, and there are effective technical strategies to reduce those emissions from existing engines. And there is a continued need for the government incentive programs to encourage their adoptions.

Senator Carper, you have been a leader in the forefront of this battle since 2005, and we thank you for that. Under your leadership, we have made two great accomplishments, in the funding of the program and its performance.

According to the EPA's second report to Congress, between 2008 and 2010, the program retrofitted, repowered or replaced over 52,000 older engines found in a wide variety of applications, resulting in about 12,000 tons of PM emission reductions and 200,000 tons of NO_x reduced at the same time.

Let me emphasize, we believe there is still plenty of work to do that will allow more need for these programs. Further EPA action to reduce levels of allowable emissions of ozone and meeting new particulate standards will make the need even greater. DERA has provided important Federal funds in a very competitive process that other programs should aspire to, and has been able to leverage those dollars, leverage roughly \$3 in non-Federal funding for every \$1 in Federal funding to make these air quality benefits.

The other provisions that we looked for help in reducing emissions include the Congestion Mitigation Air Quality Improvement Program of the MAP-21, the transportation legislation, which allows that particulate matter non-attainment areas may spend up to 25 percent of their CMAQ allocation toward retrofitting diesel engines.

Finally, black carbon reductions from new technologies are likely to have a measurable impact in reducing and mitigating the impact of a warming planet. These reductions and these new engines have

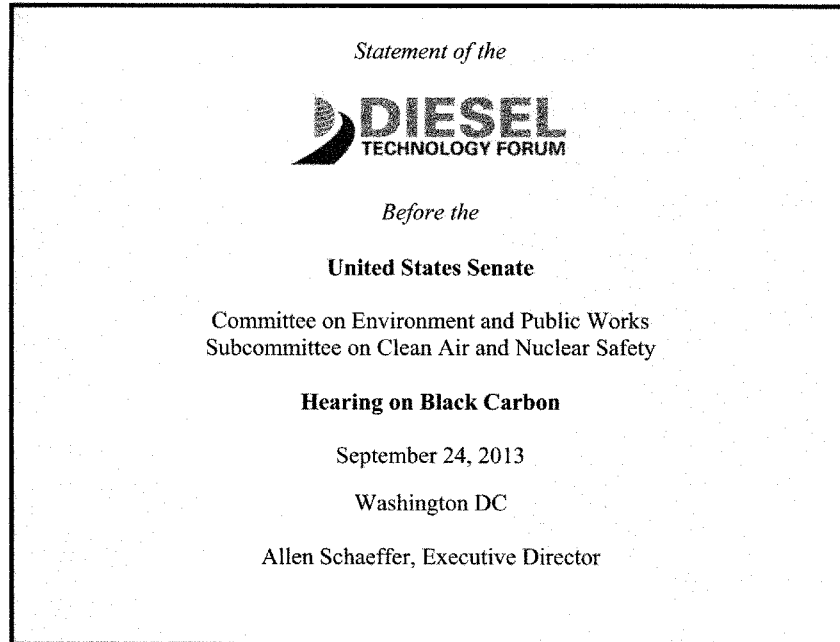
had significant benefits, as I have outlined. According to some scientists, emission reductions from diesel engines in the U.S. may mitigate up to 15 percent of the U.S. contribution to a warming planet. Climate scientists estimate that clean diesel technologies deployed in California alone may mitigate global warming effects by 5 percent to 15 percent.

The success of these strategies has not gone unnoticed by the international community, and in part because of the success in reducing black carbon here, the United Nations Environment Program, UNEP, is working with partners across the globe to urge the adoption of clean diesel fuel and engines.

So in conclusion, diesel engines play a significant role in the U.S. economy and the U.S. is a leader in clean diesel technology that improves air quality and reduces greenhouse gas emissions, including emissions of particulate matter, of which black carbon is a component. Thanks to the investment in cleaner fuels, emissions and emissions control technologies, diesel emissions have fallen by orders of magnitude to near zero levels. While new engines are meeting near zero standards, older engines and existing equipment still have distinct economic value to tens of thousands of small businesses out there. Incentive programs such as DERA and CMAQ go a long way toward helping those small businesses do better with their emissions.

Thank you very much for the opportunity to testify today.

[The prepared statement of Mr. Schaeffer follows:]



INTRODUCTION

Good Morning. My name is Allen Schaeffer and I serve as Executive Director of the Diesel Technology Forum, a not-for-profit educational group representing the nation's leading diesel engine, vehicle and equipment manufacturers, fuel refiners and suppliers, and those that manufacture emissions control technology as well as allied organizations.

We appreciate the opportunity to appear today before the Subcommittee today and would like to address the following issues relative to diesel technology and emissions of black carbon and particulate matter:

- The importance of diesel technology to the global economy and issues related to black carbon emissions;
- The new generation of clean diesel technology and what it offers in terms of fuel savings and emissions reductions and how it is being accepted;
- The availability and effectiveness of strategies to reduce emissions from existing engines; and
- The impacts of new technology and upgraded existing engines and equipment regarding emissions of particulate matter/black carbon, nitrogen oxide emissions.

A. Diesel Technology Plays a Key Role in the Global Economy and a declining role in black carbon emissions

Today's hearing is focused on emissions of black carbon and cost-effective technologies strategies and federal programs with the highest potential to reduce black carbon emissions. One of the technologies at the center of today's hearing is diesel technology-- that is diesel engines, fuels and equipment. As such a focus, it is important to understand the significance of diesel power to the US economy.

Because of its unmatched combination of power, performance and energy efficiency, diesel technology is the workhorse of the US and global economy, powering over 90 percent of commercial trucks, more than three-fourths of all transit buses. 100 percent of freight locomotives and marine work boats and two-thirds of all farm and construction equipment. Diesel engines are also relied upon for back up emergency electrical generators, stationary pumps and other industrial equipment.

- Diesel is the power behind the US economy contributing \$480 billion annually in the forms of engines, equipment and fuels with a significant influence on 16 sectors of the economy from Agriculture to Wholesale Trade.
- Diesel is a job engine in every state, and account for about 1.25 million jobs-- engineering, manufacturing, servicing in every state of the U.S.
- Diesel is a productivity multiplier: \$1 earned by diesel enables another \$4.50 of added value elsewhere in the economy; and finally
- Diesel is an export powerhouse -- Diesel engines, fuel and equipment are high-value U.S. exports (5 times the average export value), accounts for 4.4 percent of all exports (\$46.2 Billion).

1. Diesel engines are a declining contributor to black carbon emissions

According to the 2012 EPA Black Carbon Report to Congress, the US accounts for about eight percent of global black carbon emissions. Of that, 52 percent comes from mobile sources, and 93 percent of that is attributed to diesel engines. EPA projects this percentage will decline 86 percent by 2030 "largely due to controls on new diesel engines."¹

Our testimony will focus on technologies designed to reduce particulate matter emissions-- of which black carbon is a component--, from diesel engines and incentives to reduce particulate matter emissions from existing diesel engines applied across the wide spectrum of diesel applications here in the United States.

B. The New Generation Of Clean Diesel Technology Delivers Dramatic Reductions In Particulate Matter And Other Emissions; is Widely Accepted And Being Rapidly Deployed In Key Sectors Of The Economy;

¹ "Report to Congress on Black Carbon. Department of the Interior, Environment, and Related Agencies Appropriations Act, 2010." March 2012. P.8. <http://www.epa.gov/blackcarbon/2012report/fullreport.pdf>

For the last thirteen years, the diesel industry has been on a journey to reduce emissions to near zero levels. Today I am pleased to report that we have arrived at our destination. Engines manufactured today to meet current U.S. Environmental Protection Agency (EPA) emissions requirements result in dramatic reductions in particulate matter and other criteria pollutants including oxides of nitrogen.

Beginning in 2000, EPA established a regulatory pathway for highway diesel engines to reach near zero emissions in a ten year period. In 2004, regulations were also established for the many categories of off-road diesel engines and equipment setting forward a similar set of emissions goals. Thanks to the adoption and widespread availability of ultra-low sulfur diesel fuel beginning in 2006, engine manufacturers were able to deploy innovative emission control solutions to radically reduce particulate matter and oxides of nitrogen emissions.

Across the wide spectrum of new diesel engine applications, particulate matter emissions have now reached near-zero levels.

As shown in **EXHIBIT 1**, for heavy duty on-road commercial trucks and buses, particulate matter and oxides of nitrogen emissions have decreased 98 percent relative to an engine manufactured in 1988. For example, an engine manufactured in 1988 emitted 0.6 grams of particulate matter/brake-horsepower-hour (g/bhp-hr); (EPA's standard unit for HD emissions measurement). EPA regulations in place for engine model year 2007 that mandated new clean diesel standards, required 0.1 (g/bhp-hr) and 2010 emissions standards require 0.01 g/bhp-hr for particulate matter – a significant advancement towards near zero emissions. In 2010, the final component of the EPA emissions regulations was implemented that resulted in near-zero emissions for nitrogen oxides (NOx).

1. New Clean Diesel Engines are Rapidly Gaining Ground in the Trucking Industry

Not only are these new engines near zero emissions but they are also gaining acceptance in the trucking industry and delivering tangible clean air benefits today. According to data recently compiled by R.L. Polk and depicted in **EXHIBIT 2**, almost one-in-three heavy duty trucks deployed across the wide spectrum of heavy duty on-road applications today is now of 2007 or newer vintage of clean diesel standards. These engines are found on highways and in communities and towns today in the form of heavy-duty work trucks, buses, fire trucks, short-haul and long-haul trucks and tractor combinations.

- According to research commissioned by the Diesel Technology Forum, these heavy duty on-road engines that meet or exceed 2007 U.S. EPA clean diesel emissions criteria have already contributed to a reduction of 27,000 tonnes of particulate matter and almost 1 million tonnes of oxides of nitrogen.

Significant emissions benefits are achieved for emissions other than particulate matter. A decade long pursuit to improve fuel economy and achieve greenhouse gas emissions reductions, including carbon dioxide (CO₂) are also being realized in the heavy-duty on-road sector. The first ever fuel economy and greenhouse gas reduction requirements for commercial vehicles and engines were adopted in 2011 for model year 2014 to 2018 and some truck and engine

manufacturers are already meeting these requirements a year early. Significant fuel savings and greenhouse gas emissions will be achieved thanks to investment in innovative technologies.

- According to research commissioned by the Diesel Technology Forum, fuel economy and emissions control technologies deployed on trucks beginning in 2007 reduced fuel consumption by 560 million gallons of fuel, or 13 million barrels of crude oil and reduce CO₂ emissions by 5.7 million tonnes. We expect these fuel savings and emissions reductions to continue with new investments in innovative engine, emissions and vehicle designs.

Similarly impressive emission reduction gains, including black carbon associated with particulate, have been achieved in the heavy duty off-road population of engines found in construction, agricultural, mining, maritime and other applications. Given the wide diversity in engine size and applications in the off-road sector, EPA regulations adopted in 2004 provided for a gradual phase-in of these clean diesel requirements according to a tiered approach beginning with smaller size engines several years ago.

The final phase of the so-called Tier 4 emissions requirements has already been met with the smaller and highest volume off road engines and equipment. Beginning January 1 2014, these near-zero standards will also be met by the larger engines manufactured beginning in 2014 and 2015 as shown in **EXHIBIT 3**. These Tier 4 final engines are used for example in very large earthmoving machines and marine work boats.

C. Efforts to Replace and Retrofit the Population of Existing Engines Contributes to Significant Emissions Reductions

Diesel engines are known for their durability and reliability, and it is not unusual to see vehicles and equipment with engines purchased a decade ago, or even earlier, still in service, and of value to those who own and use this equipment in their businesses.

In the course of developing cleaner diesel engines and fuels, many modern emission control technologies were found also to be suitable for deployment on existing vehicles and equipment. Owners of existing diesel powered vehicles and equipment could dramatically reduce emissions, including particulate matter, by investing in these devices without scrapping the entire vehicle or equipment.

“Diesel retrofit” has become a term of art reflecting a number of strategies and choices for modernizing and upgrading existing diesel engines. The term has come to encompass efforts to retrofit existing engines with modern emissions control devices, repower older equipment or vehicles by purchasing a new engine or rebuilding a new engine to meet newer standards or refueling the equipment to operate on clean fuels. In some instances, the term also incorporates scrapping the vehicle or equipment and purchasing new.

Congressional leaders recognized as early as April 2004 the value and potential of clean diesel technology and the opportunity for upgrading existing engines. A diverse array of 32 groups came together to provide input on what was to become the Diesel Emissions Reduction Act (DERA) in 2005, authorizing up to \$200 million annually. At last count, almost 1,000 groups

and organizations have signed on in support of this program.

DERA has improved America's air quality by modernizing older diesel engines and equipment through engine replacements and retrofits. According to EPA's Second Report to Congress, funding appropriated between 2008 and 2010 retrofitted, repowered or replaced over 52,000 older engines found on a wide variety of applications from school buses, long haul trucks, construction equipment and even ferryboats.² Diesel particulate filters and oxidation catalysts were the most popular technology choice among vehicle and equipment owners comprising almost half of all chosen emission reduction technologies. Retrofit funding provided between 2008 and 2010 resulted in over 12,000 tons of particulate matter emissions reduced and over 200,000 tons of NOx – an impressive achievement that provides real air quality benefits to almost every community.

There is still a viable opportunity and role for federal efforts to incentivize continued equipment modernizing and upgrading activities. While DERA was never intended to modernize and upgrade all existing engines and equipment, there are still many opportunities today where federal funding assistance could accelerate introduction of low-emissions technologies in key uses or geographic regions. Additionally, DERA has provided federal funds in a competitive process that encourages the private sector and states and localities to also provide funding matches. By doing so, DERA has been able to leverage roughly three dollars in non-federal funding for every federal dollar to generate air quality benefits.

In addition to the DERA program, a provision included in the Congestion Mitigation and Air Quality Program (CMAQ) authorized under federal surface transportation spending legislation signed into law in July 2012, allows that states with particulate matter non-attainment areas may spend up to 25% of their CMAQ allocation to retrofit construction equipment used in federal highway projects. This program has the potential to provide significant additional retrofit funding to targeted regions with air quality concerns and may also provide substantial and tangible air quality benefits.

D. Acquisition of New Technology and Upgrading of Existing Diesel Engines Reduce Particulate Emissions/Black Carbon

The introduction of new engines and retrofitted older engines results in impressive reductions of black carbon, a component of particulate matter, a short lived climate pollutant that contributes to global warming. As mentioned earlier, new clean diesel engines emit 98% less particulate matter compared to an engine manufactured in 1988. Thanks to cleaner diesel engines, some researchers estimate that particulate matter emission reductions from diesel engines in the U.S. may mitigate up to 15% of the U.S. contribution to a warming planet.

Black carbon, also known as soot, is thought to have a net warming effect on the earth by absorbing light and turning that energy into heat. It also is believed to darken the surfaces of ice

² Second Report to Congress: Highlights of the Diesel Emissions Reduction Program, US EPA December 2012. <http://www.epa.gov/cleandiesel/documents/420r12031.pdf>

and snow when deposited on them, reducing their ability to reflect light while increasing heat absorption and melting.

Thanks to the introduction of clean diesel technologies, U.S. black carbon emissions are expected to fall precipitously. As noted previously, the EPA estimates that, as of 2005, prior to the introduction of clean diesel technology, 52% of U.S. black carbon emissions were attributable to diesel engines. Forest fires, biomass burning such as wood stoves and residential heating comprise much of the remaining source of black carbon emissions. Globally cook stoves, furnaces and forest fires are the largest contributor to black carbon. EPA estimates that black carbon emissions will decline by 86% due largely to diesel emissions regulation in place for new engines and the continued retrofit of older engines.³

The California Air Resources Board (CARB) also concluded that strict diesel emissions standards including those for particulate matter and retrofit activities contribute to a significant decrease in black carbon emission in California. By 2015, CARB estimates that on- and off-road diesel equipment and vehicles will represent less than 9% of particulate matter emissions. Residential heating and road dust will contribute more to soot emissions. Thanks to the rapid adoption of clean diesel technologies, diesel engines will fall from the 6th largest contributor in soot emissions in 2010 to the 12th largest by 2015.⁴

Climate scientists estimate that clean diesel technologies deployed in California alone may mitigate global warming effects by 5% to 15%.⁵ The success of diesel emission reduction strategies in the U.S. has not gone unnoticed by the international community. In part based on the success of reducing black carbon emissions from diesel engines in the U.S. the United Nations Environment Program (UNEP) is working with partners across the globe to urge the adoption of clean diesel fuel and engines.

E. Conclusions

Diesel engines play a key role in the US and global economy. The U.S. is a leader in emission reduction strategies that improve air quality and in turn may reduce the impact of global warming. Thanks to investments in cleaner fuels, engines and emission control technologies, diesel emissions have fallen by orders of magnitude to near zero levels. These advances have reduced the contribution of diesel engines to black carbon emissions dramatically and further reductions are projected by the US EPA thanks to the adoption of new clean diesel technology.

³ P.8. "Report to Congress on Black Carbon. Department of the Interior, Environment, and Related Agencies Appropriations Act, 2010." March 2012. <http://www.epa.gov/blackcarbon/2012report/fullreport.pdf>

⁴ California Air Resource Board, California Emissions Projection Analysis Model

⁵ California Air Resources Board, Symposium: "Black Carbon Reductions in California and its Implications for Regional and Global Climate Change Mitigation". Veerabhadran Ramanathan, Ph.D. and Lynn M. Russell, Ph.D. July 23, 2013

While new engines are meeting near-zero emissions levels, incentives in place can help the owners of existing equipment improve emissions as well, and there are further opportunities for the federal government to encourage and incentivize continued progress.

The US is a leader in clean diesel technology and our investments in these technologies have not gone unnoticed in markets overseas. Diesel technology is one of the most export intensive industries comprising over 4% of U.S. exports or \$46.2 billion. One in four diesel engines manufactured in the U.S. is ultimately destined for a market overseas.

Investment in clean diesel technologies continues as engine, vehicle and equipment manufacturers and fuel producers work to further reduce emissions and in the case of highway vehicles, meet aggressive new targets for fuel efficiency improvements and CO2 reductions.

Thank you for the opportunity to appear today and I would be happy to answer any questions.

Contact Information

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(Exhibits Follow)

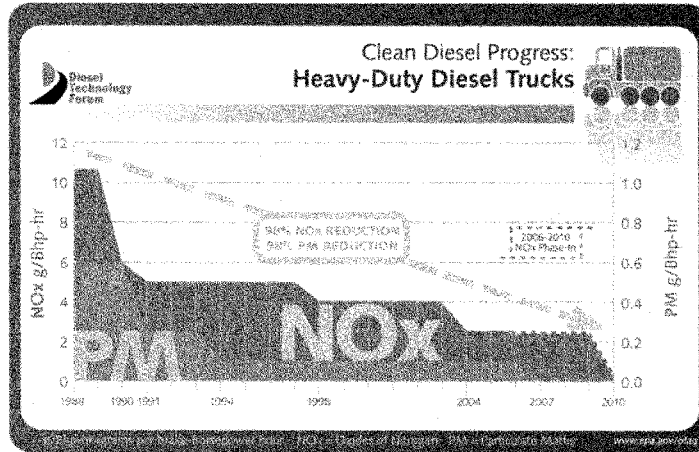
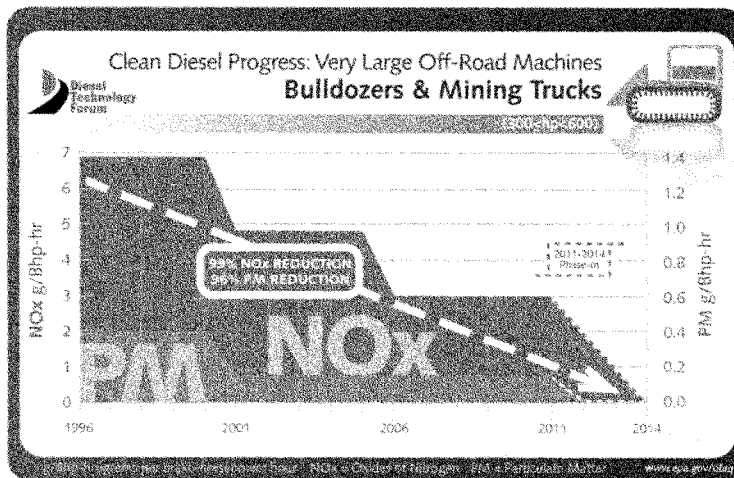
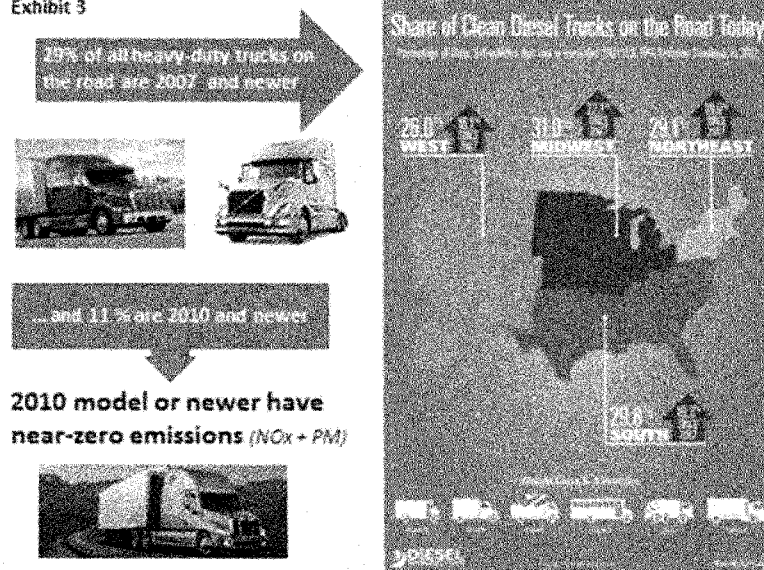
EXHIBIT 1**EXHIBIT 2**

Exhibit 3



Senator CARPER. Thank you very much, Mr. Schaeffer.
Mr. Singletary, welcome aboard. Please proceed.

**STATEMENT OF ROBERT SINGLETARY, ATTORNEY, OFFICE OF
THE GENERAL COUNSEL, OKLAHOMA DEPARTMENT OF EN-
VIRONMENTAL QUALITY**

Mr. SINGLETARY. Good morning, Chairman Carper, Ranking Member Sessions and members of the Subcommittee. Thank you for the opportunity to testify at today's hearing.

My name is Robert Singletary, and I serve as the supervising attorney for the Air Quality and Land Protection Divisions at the Oklahoma Department of Environmental Quality. I have been asked to provide testimony today regarding the implementation of the Diesel Emissions Reduction Act in Oklahoma, and the resulting reductions in diesel emissions and the associated impacts on air quality.

The State of Oklahoma has participated in the DERA program since 2008. During this period, Oklahoma has administered funds allocated by the U.S. Environmental Protection Agency in an amount of just over \$4.3 million. The majority of those funds, approximately \$3.1 million, came via the American Recovery and Reinvestment Act of 2009. Aside from the funding provided through ARRA, the annual funding allocated to Oklahoma by EPA for ERA projects during this period was between approximately \$190,000 and \$295,000 annually until fiscal year 2013. In addition, the State of Oklahoma has contributed just over \$300,000 in State matching funds.

Since beginning participation in the program in 2008, the Oklahoma Department of Environmental Quality has overseen the completion of approximately 413 DERA projects, including the replacement of 118 older diesel school buses with new vehicles meeting more stringent emission limits, the installation of diesel particulate filters and related technologies on 18 school buses, the installation of diesel oxidation catalysts on 82 school buses, the installation of closed crankcase ventilation systems on 125 buses, and the installation of auxiliary heaters on 55 buses.

Diesel engines are designed to have very long operating life spans and many of the buses that have been replaced in Oklahoma were more than 20 years old. It is not uncommon for diesel school buses of that age to have emissions of hydrocarbons, carbon monoxide and nitrogen oxides that are 65 to 95 percent greater than those of the new school buses. Similarly, and of particular relevance to the black carbon discussion, it is not uncommon for fine particulate matter, PM_{2.5} emissions, from older diesel buses to be 90 percent greater than the newer certified models.

Installation of certain retrofit technologies also greatly reduces the percentages of PM_{2.5} emissions. For example, the installation of diesel particulate filters reduces PM_{2.5} emissions by 50 to 60 percent and the installation of diesel oxidation catalysts reduces such emissions by nearly 30 percent.

In total, the projects administered by the Oklahoma Department of Environmental Quality have resulted in emissions reductions over the life of the replaced or retrofitted equipment by approxi-

mately 21 tons of PM_{2.5}, 37 tons of hydrocarbons, 172 tons of carbon monoxide, and 353 tons of NO_x.

In addition to the emission reductions that are directly attributable to the replaced or retrofitted equipment, the DERA program has also provided the State with an opportunity to educate school districts regarding the economic and health benefits that are associated with implementing anti-idling strategies. These strategies can significantly reduce the overall emissions from these diesel engines, whether or not they are replaced or retrofitted. And they also significantly reduce the exposure to impacted children to concentrated levels of these pollutants. Moreover, any school or school district participating in the program was required to implement an anti-idling policy across its entire fleet.

Based on the reductions in the proposed funding allocations for the upcoming year, the Oklahoma Department of Environmental Quality chose not to participate in the program next year. However, the agency continues to support the voluntary nature of the DERA program and the opportunity for States to implement it at the State level. Assuming a funding level that is sufficient to warrant the minimal administrative burden that is associated with implementing the program, the resulting emissions, especially in light of the sensitive population impacted, justify the agency's continued participation in the program.

Again, thank you, Chairman Carper, members of the Committee, for the opportunity to testify today.

[The prepared testimony of Mr. Singletary follows:]

**BEFORE THE UNITED STATES SENATE
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY**

**Hearing Entitled “Black Carbon – A Global Health Problem with Low-Cost Solutions”
September 24, 2013**

**TESTIMONY OF ROBERT D. SINGLETARY
SUPERVISING ATTORNEY FOR AIR QUALITY AND LAND PROTECTION
OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY**

Good morning Chairman Carper, Ranking Member Sessions, and members of the Subcommittee. Thank you for the opportunity to testify at today’s hearing. My name is Robert Singletary and I serve as the Supervising Attorney for the Air Quality and Land Protection Divisions at the Oklahoma Department of Environmental Quality.

I have been asked to provide testimony today regarding the implementation of the Diesel Emissions Reduction Act (“DERA”) in Oklahoma, and the resulting reductions in diesel emissions and the associated impact on air quality.

The State of Oklahoma has participated in the DERA program since 2008. During this period, Oklahoma has administered funds allocated by the U.S. Environmental Protection Agency (“EPA”) in an amount of just over four million three hundred thousand dollars (\$4,300,000). The majority of those funds (approximately three million one hundred thousand dollars (\$3,100,000)) came via the American Recovery and Reinvestment Act of 2009 (“ARRA”). Aside from the funding provided through ARRA, the annual funding allocated to Oklahoma by EPA for DERA projects during this period was between approximately one hundred ninety thousand dollars (\$190,000) and two hundred ninety-five thousand dollars (\$295,000) until FY 2013. In addition, the State of Oklahoma has contributed just over three hundred thousand dollars (\$300,000) in State matching funds to the program.

Since beginning participation in the program in 2008, the Oklahoma Department of Environmental Quality has overseen the completion of approximately 413 DERA projects that have resulted in diesel emissions reductions and public health benefits. These projects include:

- Replacement of 118 older diesel school buses with new vehicles which meet more stringent emission limits;
- Installation of diesel particulate filters (“DPF”) and related technologies on 18 school buses;
- Installation of diesel oxidation catalysts (“DOC”) on 82 school buses;
- Installation of closed crank ventilation systems (“CCVS”) on 125 school buses; and
- Installation of auxiliary heaters on 155 school buses.

Diesel engines are designed to have very long operating lifespans. Many of the school buses replaced in Oklahoma were more than twenty (20) years old. It is not uncommon for diesel school buses of that age to have emissions of hydrocarbons (“HC”), carbon monoxide (“CO”), and nitrogen oxides (“NO_x”) that are sixty-five to ninety-five percent (65-95%) greater than those of new diesel school buses. Similarly, and of particular relevance to the Black Carbon discussion, it is not uncommon for fine particulate matter (“PM_{2.5}”) emissions from older diesel buses to be ninety percent (90%) greater than the newer certified models.

Installation of certain retrofit technologies also greatly reduces the percentage of PM_{2.5} emissions; for example, the installation of diesel particulate filters reduces PM_{2.5} emissions by fifty to sixty percent (50-60%) and the installation of diesel oxidation catalysts reduces such emissions by nearly thirty percent (30%).

In total, the projects administered by the Oklahoma Department of Environmental Quality have resulted in emission reductions over the life of the replaced or retrofitted equipment by approximately: 20.96 tons of PM_{2.5}; 36.69 tons of HC; 171.66 tons of CO; and 353.45 tons of NO_x.

In addition to the emission reductions directly attributable to the replaced or retrofitted equipment, the DERA program has also provided the State with an opportunity to educate school districts regarding the economic and health benefits associated with implementing anti-idling strategies. These strategies can significantly reduce the overall emissions from these diesel engines whether or not they are replaced or retrofitted, and significantly reduce the exposure of impacted children to concentrated levels of these pollutants. Moreover, any school or school district participating in the program was required to implement an anti-idling policy across its fleet of buses.

Based on the reductions in the proposed funding allocations for the upcoming year, the Oklahoma Department of Environmental Quality chose not to participate in the program next year; however, the agency supports the voluntary nature of the DERA program and the opportunity for States to implement it at the local level. Assuming a funding level sufficient to warrant the minimal administrative burden associated with implementing the program, the resulting emission reductions (especially in light of the sensitive population impacted) justify the agency's participation in the program.

Again, thank you Chairman Carper and members of the Subcommittee, for the opportunity to testify before you today.

Senator CARPER. Thanks, Mr. Singletary. When we mentioned the idling strategy, I was in a school not long ago where the school buses had gathered to take the students home. And the point you made is a really good one, all these kids have to walk by their buses, through their buses in order to get on the buses. That is a very good point. If they are idling, if they are not idling, if they stop the idling, you save fuel and probably save some lives as well. That is a great point. Thank you.

Mr. Harris.

STATEMENT OF ROBERT C. HARRIS, JR., VICE PRESIDENT, ENVIRONMENTAL AND PROGRAM MANAGEMENT, ALABAMA STATE PORT AUTHORITY

Mr. HARRIS. Thank you, Chairman Carper, Ranking Member Sessions and distinguished members of the Subcommittee. Thank you for the opportunity to discuss black carbon emissions and the Alabama State Port Authority's positive experiences to reduce diesel emissions and leverage Federal financial support under the Diesel Emissions Reduction Act.

My name is Bob Harris and I oversee environmental and Federal programs for the Port Authority. The Authority represents the public cargo terminals at the Port of Mobile, which is currently the 13th largest of the Nation's 150 commercial deepwater seaports. The Alabama State Port Authority's economic value in Alabama alone tops \$18.7 billion and directly and indirectly generates over 127,000 jobs.

The Alabama State Port Authority is one of three commercial deepwater U.S. seaport authorities that owns and operates a freight railroad. The Authority's terminal railway consists of 75 miles of track and operates 10 diesel-powered locomotives. The terminal railway is the largest public seaport owned and operated terminal railroad in the Nation, handling over 133,000 cars annually.

In and around port communities, the seaport industry is increasingly factoring air quality when addressing port operations. Cargo handling equipment, trucks, locomotives, tugboats, dredges, ferries and ships mostly rely on diesel engines for power. Older diesel engines can emit elevated levels of particulate matter and nitrogen oxides which can contribute to air quality concerns.

In 2008, the Alabama State Port Authority began pursuing the goal of voluntarily reducing emissions at the Port's terminals by seeking funding assistance made available through the Environmental Protection Agency's National Clean Diesel Funding Assistance Program to purchase a new class of fuel efficient, low emission locomotive engines. The Port's objective was to begin converting its 10 locomotives to cleaner burning, more efficient engines that met Tier 2 emissions standards.

In 2011, EPA awarded the Port a \$953,921 grant to improve air quality through assistance funding from the Diesel Emissions Reduction Act of 2010. The Port Authority's \$1.58 million project would repower a 1980 diesel electric switching locomotive with state-of-the-art GenSet technology with a goal to significantly reduce existing locomotive emissions by up to 95 percent and reduce fuel consumption by 50 percent.

GenSet technology replaces a single large diesel engine in the locomotive with two smaller engines that can be shut down or operated depending on power demand requirements. Without compromising traction and power, this approach conserves fuel and reduces noise during operations by using only one engine in low power applications and powering up both engines in higher power demand applications. The Port Authority took delivery of the first retrofitted engine in February 2013.

In follow up to our positive experience with DERA, the Port Authority looked to build on the program's success. The Port Authority sought out and has received a \$1.35 million grant under DERA 2012 to repower two more terminal railways circa 1980 diesel electric switching locomotives. It is estimated that this \$2.02 million repower project will reduce particulate matter emissions by 60 tons over the lifetime of these two engines. Additionally, these two engine repowers will generate an estimated 43,000 gallons of diesel fuel savings annually.

The Alabama State Port Authority applauds the Subcommittee for its past leadership in support of the DERA grant program and for its ongoing leadership in addressing black carbon impacts. The Port Authority thanks the members for the opportunity to speak on our experiences with this critical program, and I am happy to address any questions.

[The prepared statement of Mr. Harris follows:]

**United States Senate
Committee on Environment and Public Works
Subcommittee on Clean Air and Nuclear Safety
Hearing on
“Black Carbon – A Global Health Problem with Low-Cost Solutions”
September 24, 2013 – 10:30 a.m.
Room 406 / Dirksen Senate Office Building
Written Testimony of Robert C. Harris, Jr.
Vice President, Environment & Program Management
Alabama State Port Authority**

Chairman Carper, Ranking Member Sessions, and distinguished members of the Subcommittee, thank you for the opportunity to discuss black carbon emissions and the Port Authority's positive experiences to reduce diesel emissions and leveraging federal financial support under the Diesel Emissions Reduction Act (DERA). My name is Bob Harris, and I oversee environmental and federal programs for the Alabama State Port Authority.

The Authority represents the public cargo terminals at the Port of Mobile, which is currently the 13th largest of the nation's 150 commercial, deep-water seaports. The U.S. Army Corps of Engineers Waterborne Commerce Center reports, in calendar year 2011, the Port of Mobile handled over 55 million tons of import, export and domestic cargo. Mobile's public seaport terminals serve bulk, neo-bulk, containers, oversized and heavy lift cargoes and general cargo bound to and from manufacturing, agribusiness, mining, processing, retail/distribution, and building industries. The Alabama State Port Authority's economic value in Alabama alone tops \$18.7 billion and directly and indirectly generates over 127,000 jobs.

The Alabama State Port Authority is one of three commercial, deep-water, U.S. seaport Authorities that own and operate a freight railroad. The Authority's Terminal Railway (TASD) consists of 75 miles of track and ten diesel powered locomotives and handles over 133,000 revenue rail cars annually. In most commodity groups, the

Terminal Railway (TASD) handles nearly 60 percent of the cargo volume moving through the public terminals. The Terminal Railway (TASD) also provides rail switching services for five Class I and two Class III railroads at the Port of Mobile, making it the largest public seaport owned and operated terminal railroad in the nation.

In and around port communities, the seaport industry is increasingly factoring air quality when addressing landside operations, truck and rail traffic impacts associated with population and manufacturing growth and expanding U.S. trade. Cargo-handling equipment, trucks, locomotives, tugboats, dredges, ferries and ships mostly rely on diesel engines for power. Older diesel engines can emit elevated levels of particulate matter (PM) and nitrogen oxides (NO_x), which can contribute to quality concerns. Reducing diesel engine emissions is particularly important for U.S. ports that operate in areas designated as "non-attainment" or "maintenance" for one or more of the national ambient air quality standards (NAAQS). While the Port of Mobile currently does not reside in a "non-attainment" area, the Port Authority is partnering with the Environmental Protection Agency (EPA), the American Association of Port Authorities and other U.S. seaports to voluntarily reduce emissions from older diesel engines and openly support EPA's National Clean Diesel Campaign.

The Alabama State Port Authority is proactive in the Southeast Diesel Collaborative (SEDC), which represents the National Clean Diesel Campaign in eight southern states. The Collaborative advocates voluntary reduction of diesel emissions through a variety of strategies, including the installation of new technology emission control devices, the use of sustainable alternative fuels, deploying idle reduction practices, and repowering or replacing old diesel engines. Many of these strategies can also help save money, such as the implementation of idle reduction practices and the use of more efficient and cleaner engines to reduce fuel consumption. The SEDC has implemented 473 projects, in seven years, to clean up the emissions from 534,000 diesel engines, mostly from an estimated 14,000 buses located throughout the south. The SEDC has been successful in reducing nitrogen oxides (NO_x) emissions by 36,370 tons, volatile organic compounds (VOCs) by 3,900 tons, particulate matter (PM) by 2,800 tons and Carbon Dioxide (CO₂) emissions by 769,770 tons. To date, the federal

government has invested \$73 million in grants in the southeast, while local sponsors have leveraged these grants toward \$707 million invested realizing nearly a ten to one (10:1) return on federal investment.

In 2008, the Alabama State Port Authority pursued its own Campaign goals to reduce emissions at the port's terminals by twice seeking funding assistance made available through the Environmental Protection Agency's (EPA) National Clean Diesel Funding Assistance program to purchase a new class of fuel efficient, low emissions locomotive engines. The port's objective was to begin converting its ten locomotives to cleaner burning more efficient engines that met Tier II emissions standards.

In 2011, EPA awarded the port \$953,921 under a \$1.58 million grant request to improve air quality by rapid deployment of clean diesel technologies through assistance funding from the Diesel Emissions Reduction Act (DERA) of 2010. The EPA's portion is only applied to equipment costs, with the Port Authority picking up all remaining costs associated with the project. The Port Authority's project would repower a 1980 GM EMD MP-15 diesel-electric switching locomotive with state-of-the-art GenSet technology with a goal to significantly reduce existing nitrous oxides, particulate matter and hydrocarbon locomotive emissions by up to 95%, and reduce fuel consumption by 50%. The Authority's management identified an EPA certified off-road industrial diesel engine, or Ultra-Low Emitting Locomotive (ULEL), that met the Agency's locomotive emission regulations for 2012 under Tier 3. Due to the ULEL's highly favorable economic benefits of fuel savings, tractive effort capability, noise reduction, and reduced maintenance cost, the Port Authority estimated a faster overall return on investment, which would allow future budget allocations for additional locomotive repowers.

The Port Authority took delivery of the first retrofitted engine in February 2013. The Terminal Railway Locomotive 802 was immediately placed into service realizing the 50% fuel use reduction goal and an 80%-90% reduction in nitrous oxides and particulate matter, without compromising engine performance thresholds.

In follow-up to our positive experience with DERA, the Port Authority looked to build on the program's success by seeking another grant under DERA 2012 to repower

two Terminal Railway (TASD) circa 1980 MP-15 diesel-electric switching locomotives. This \$3.37 million project will replace the single larger diesel engines in each locomotive with several smaller ULEL GenSet engines that can be shut down or operated depending upon power demand requirements. This approach eliminates continuous idle conditions, which consume four or five gallons of diesel fuel per hour, and provides more opportunities to conserve power and fuel during actual operations, i.e., using only one engine in low power applications, and powering up two or three engines in higher power demand applications. The EPA awarded \$1.35 million to the Port Authority, which will provide the remaining costs at just over \$2.02 million. It is estimated that over the lifetime of the engines, nitrous oxide emissions will be reduced by 1,730 tons, hydrocarbon emissions will be reduced by 161 tons, and particulate matter emissions will be reduced by 60 tons. Additionally, these two engine repowers will generate an estimated 43,000 gallons of diesel fuel savings annually, thereby demonstrating that "Green is Green," and that environmental stewardship helps the bottom line.

The Alabama State Port Authority applauds the Subcommittee for its past leadership and support of the DERA grant program and for its ongoing leadership in addressing black carbon impacts. Under-investment in this vital program will result in slower implementation of federal and industry goals to reduce diesel emissions and fuel consumption. The Alabama State Port Authority is very appreciative of its partnership with EPA and the federal government's efforts to help our port leverage increasingly scarce capital toward the repowering a critical business segment within our overall operations. The Port Authority thanks the Members for the opportunity to speak on our experiences with this critical program, and I am happy to address any questions.

ALABAMA STATE PORT AUTHORITY

Robert C. Harris, Jr., Vice President, Environment & Program Management on behalf of
James K. Lyons, Director/Chief Executive Officer

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Senator CARPER. Mr. Harris, I am glad you came today. I am glad you all came today, but I said to Senator Sessions, what compelling testimony. I would just say to my colleagues, think about this. For every \$1 that we appropriate for DERA, it leverages \$3 additional. And for every \$1 that we appropriate through DERA, we get about \$13 worth of health savings.

So if you think about the \$1 from DERA that leverages the other \$3, if you multiple three times \$13, you actually get for every \$1 in DERA spending, we are getting about \$39 worth, if my math is right, about \$39 worth of health benefits. Pretty compelling.

And the point that you made, Mr. Harris, about the fuel savings as well on the locomotives that you have in, is it Mobile?

Mr. HARRIS. Yes.

Senator CARPER. That is very compelling. We have to figure out a way, these numbers are just too compelling, we have to figure out a way to get some additional moneys moved, Federal moneys moved through the appropriation process into this program.

Before we get started with questions, I just want to first ask unanimous consent to submit for the record a letter from the President and CEO of the American Association of Port Authorities, Kurt Nagle, I expect you know him. Kurt Nagle, in support of fully funding DERA at the authorized levels.

[The referenced letter follows:]



Seaports
Deliver
Prosperity

September 23, 2013

The Honorable Thomas Carper and Jeff Sessions
Chairman and Ranking Member
Subcommittee on Clean Air and Nuclear Safety
Committee on Environment and Public Works
United States Senate
Washington D.C. 20510

Dear Chairman Carper and Ranking Member Sessions:

We are writing today to offer comments from the American Association of Port Authorities (AAPA) for your hearing on September 24 on "Black Carbon – A Global Health Program with Low-Cost-Solutions." AAPA represents the leading public port authorities in the Western Hemisphere and our comments today represent the recommendations of our U.S. members.

Air quality issues are receiving increased attention at U.S. ports, and reducing air emissions is particularly important to them, especially to ports located in urban areas with a close population base. While new engine regulations can make an impact, long term, they do not address current equipment emissions. A key federal program that has helped ports address current air emissions challenges is the Environmental Protection Agency's Diesel Emissions Reduction Act (DERA) grant program. AAPA is a strong supporter of DERA and has witnessed the great value this program has had in lowering air emissions from diesel engines including truck, vessel, yard equipment and rail used to move cargo in and out of our nation and ports.

AAPA is supportive of fully funding DERA at the level authorized by the Energy Policy Act of 2005, which is \$100 million. Unfortunately, the program was only funded at less than \$20 million in Fiscal Year (FY) 2013. The President's budget for FY 2014 proposed to fund DERA grants at only \$6 million, which would represent a further decrease if adopted by Congress.

DERA grant funding has enabled public and nonprofit entities to achieve significant emissions reductions in a number of targeted sectors, including in ports and maritime. EPA estimated in a 2008 report to Congress that for every dollar spent on DERA an average of more than \$20 is generated in health benefits.

DERA not only improves quality of life in terms of health but supports American jobs as well. The program provides grants to fund engine upgrades and retrofits, many of which are manufactured in the United States. The installation of new engines or retrofit technology is usually done on or near the site where the engine is used, creating or preserving jobs for skilled workers.

We urge your continued leadership in fully funding DERA at its authorized levels and continuing this important program that helps ports and their urban communities quickly reduce emissions from older diesel engines.

Sincerely,

Kurt J. Nagle
President and CEO
KJN:kp-sm/tsm

Senator CARPER. I want to go back to, if I could, Mr. Johnson, to something that you said. I was telling Jeff here that my primary vehicle for moving around the State of Delaware is a 2001 Chrysler Town and Country minivan. We bought it the year that I stepped down as Governor of Delaware in 2001. And it now has 353,000 miles on it. It has the original engine, original transmission, original owner. And my wife says to me, when are you ever going to buy a new vehicle? And I say, why? In fact, it is in the shop today, but just for an oil change. We started changing oil last year.

[Laughter.]

Senator CARPER. Before that, all we did is wash it every 2 weeks.

But someday, I will have to get a new vehicle, and Jeff was telling me about some of the vehicles they make down in Alabama that are highly energy efficient diesel-powered vehicles, clean emissions, low emissions, which is very compelling. Made here with American technology.

I just want to go back to something you said, Mr. Johnson. Sometimes when we are driving down the highway in Delaware in my like-new Town and Country minivan, we will have on the air conditioning. Days like this we don't, and we will just circulate the outside air through the vehicle.

You made a statement included in your comments, you talked about the level of emissions that we breathe in when we do that. Would you just revisit that for us again, please? I just want to hear this again.

Mr. JOHNSON. Thank you for the chance to clarify the statements and elaborate a little bit more. Coming out of the tailpipe of an unfiltered diesel engine, the particle concentrations are 10 million to 100 million per milliliter. By the time it reaches the car, the car behind the truck or even the car a couple cars behind the truck, it is diluted a thousand times. So if you recall the arithmetic here, you go from 10 to the eighth down to 10 to the fifth, but then every breath that you take is about 100 milliliters. So you add another 10 to the 2 and you end up with 1 million to 10 million particles per breath.

Now, in your cabin, I used to work in cabin air filtration earlier in my career, and I was astounded that the air in your car changes, even if the fan is not on, about three times a minute. That was back then. I don't know what they are today. But you are essentially bringing in high volumes of fresh air into your vehicle. And this air has very high contaminant levels, when you are on the freeway.

Another comment that I would like to make is that freeway exposure is not limited to vehicles. In California, a study in Toronto, 40 percent to 50 percent of the people in those cities live within 500 yards of a highway or a major thoroughfare. These are referred to as tunnels of pollution, and this affects the children's lung capacity, asthma, and other things that are lifetime illnesses, lifetime, it is carried over for a lifetime. So when you are talking 40 to 50 percent of the population living within these freeways, vehicular emission control takes a whole new meaning. That is in L.A. today, with the tightest regulations in the country, the world.

Senator CARPER. Thank you. Thank you for that clarification.

One question, if I could, for both Mr. Schneider and Mr. Single-
 tary, then I will kick it over to Senator Sessions. As you know, I
 have another day job, you may know I have another day job as the
 Chair of the Homeland Security and Government Affairs Com-
 mittee, with my ranking member on that Committee, Tom Coburn.
 We try very hard to make sure we are getting better results for
 less money, not duplicating efforts in the Federal Government. Can
 you talk just a little bit about why, despite the overall success of
 the Clean Air Act in improving our air quality, we need programs
 like DERA and Clean Construction to reduce black carbon pollu-
 tion? Mr. Schneider.

Mr. SCHNEIDER. Sure, Senator, that is a great question. I think
 the answer primarily is that the Clean Air Act is a regulatory pro-
 gram. It tells you what you can't do or how much pollution you
 can't emit. It does not provide necessarily incentives or subsidies
 or whatever for pollution reduction. So it is a regulatory-based pro-
 gram.

And so for these diesel particulate filters that we are talking
 about, they are very effective at taking pollution out of the air, but
 they don't necessarily confer a benefit on the companies that have
 to install them. In fact, a lot of the companies that have bought
 what we call the existing diesel fleet, when they purchased them,
 they met the clean air standards that EPA had set. Now what we
 are seeing is they need to do better, it would be great if they could
 retrofit. Because those companies don't experience a direct benefit
 to that, the benefit is really a public good. So it makes sense for
 the Government to have a role in providing some incentives to help
 them do that.

Now, that might not be true for a repower like the GenSet, and
 the situation that was described in Mobile. That would be a situa-
 tion where you get the double benefit. But the filter doesn't really
 get you a fuel economy benefit. So that is a big part of it.

States do have the ability, particularly as Mr. Schaeffer men-
 tioned, that we may be seeing tighter PM and ozone standards in
 the future. States do have the ability to require these retrofits, as
 California has tried to do as part of their State implementation
 plans. So it is possible to order these retrofits. But in many areas,
 you are probably not going to see that. If we want to experience
 the benefits of these retrofits, it is a great step to have the Federal
 Government step in with DERA and Clean Construction and lend
 a helping hand.

Senator CARPER. Good. Thanks.

Mr. Singleary, same question, please.

Mr. SINGLETARY. Senator, in regard to the DERA program, I
 think the best benefit of the program is that it is assisting these
 school districts, some of them who are struggling financially to re-
 place these aging fleets. It would be very difficult on a mandatory
 basis to make them do that. So the voluntary nature of the pro-
 gram, helping them to address those, especially considering the
 sensitive population that is most impacted. In Oklahoma, we are
 currently in attainment for all the NAAQs, so we don't have the
 ability to go back, especially in regard to mobile sources, but even
 stationary sources, and achieve tighter reductions from existing
 sources. So a voluntary program like that that provides an incen-

tive for the school districts to come forward and try and replace those buses prior to the life span of the bus, or retrofit the buses to lower those emissions is very helpful.

Senator CARPER. Thanks so much.

Senator SESSIONS.

Senator SESSIONS. Thank you. I want to ask a number of questions, and maybe briefly go through and give us some perspective on where we are. Mr. Harris, thank you for your leadership at the State docks, Port Authority. Do you believe the diesel engines are environmentally beneficial, a modern, efficient diesel engine?

Mr. HARRIS. Yes, Senator, very much. There have been tremendous advances in diesel engine technology over the last several years. A modern diesel engine is very much environmentally friendly technology.

Senator SESSIONS. Share with us how much it takes per engine to retrofit it in the way you suggested with two different engines that combine, if needed, for extra power and get a 50 percent fuel reduction. What does it cost, so people know, to actually accomplish that per engine?

Mr. HARRIS. It costs approximately \$1.6 million per locomotive to do that rebuild with the GenSet technology that we have adopted.

Senator SESSIONS. So the Federal grant money was very helpful in helping you make that decision?

Mr. HARRIS. Yes. The Federal grant money allowed us to go that extra step to put in place a more emission-efficient technology and a fuel-efficient technology.

Senator SESSIONS. Does a complete new, actually two complete new engines replacing one, Mr. Johnson, you have a filter that can go on an existing engine, as I understand it. Is that correct? How much does it cost to install your product?

Mr. JOHNSON. It depends, of course, on the vehicle. Looking at a heavy duty truck, it is on the order of \$5,000 to \$7,000 per truck. Now, keep in mind that these trucks are still worth \$50,000 to \$70,000, even \$100,000. So it is a relatively small investment on a truck that is worth an order of magnitude more and will be in service for 5 or 10 years.

Senator SESSIONS. Mr. Singletary, thinking about thousands of school buses there, I calculated one time, I spent a full year of my life on a school bus, an hour just about in the morning and an hour home in the afternoon, for many years. What about new engines? Where are we heading with new engines? Is there a movement toward the more modern diesel engines or are school systems still using a gasoline engine? What do you think is best environmentally?

Mr. SINGLETARY. Senator, I believe the majority of the fleet in Oklahoma are diesel buses. Obviously the newer diesel buses, you have emissions in regard to PM that are 93 percent less than some of the older buses that are in place. Like I said in my direct testimony, some of the buses that we have replaced through our program were over 20 years old, some approaching 30 years. So there are some significant reductions between the standards when they were manufactured and the newer 2011 and newer models.

Senator SESSIONS. Mr. Schneider, do you have any observation about the choice that a school system has in buying a new bus?

Should they consider a modern diesel or would, from an environmental perspective and cost perspective, be smarter to buy gasoline?

Mr. SCHNEIDER. Typically what we find is that the school bus fleets are running on diesel. And the choice that they typically face is whether and how fast to replace those older diesel buses with new ones versus taking the money maybe through a DERA program or whatever and install a diesel particulate filter on them. Both are very effective. But we have found that you can retrofit and clean up an entire fleet through retrofits probably more efficiently and more cost effectively than replacing it. But some of the school districts have the capital budget to be able to replace their fleets.

Senator SESSIONS. But just as vehicles turn over, and some have to be replaced, do you have an opinion which would be preferable?

Mr. SCHNEIDER. I think the industry standard is diesel.

Senator SESSIONS. When you look at the overall cost and the advantages, I guess I am wrestling with the question, should we do more to incentivize the new vehicles also, not just retrofitting old ones. But diesels last a long time, some are 30 years old, still running, is that correct?

I see Mr. Schneider and Mr. Johnson are nodding. Do you have some old ones?

Mr. HARRIS. Yes, Senator, the locomotives that we have discussed were purchased in 1980. So we are talking 40-plus years.

Senator SESSIONS. So, 1980 was 40 years ago?

[Laughter.]

Senator SESSIONS. I am kind of kidding.

Well, we are making progress with the new ones. One of my staff people in Alabama commuted about 50 miles a day. And she bought a Volkswagen Beetle diesel and was getting 52 miles to the gallon. Now, that is significant, that really started my inquiry into the advantages, one way or the other, as to diesel engines as compared to gasoline engines. And that was better than hybrid engine cars yet. So it was a matter of real importance.

We have also a representative here from NAVASTAR who builds fabulous diesel engines in Alabama. We are proud of them.

Thank you, Mr. Chairman, for the hearing. These are important issues. What I like about this whole process, to me, it is a win-win in the sense that we are getting better gas mileage, bringing down the costs to the purchaser of the vehicle, getting better environmental impact and having the savings more than pay for the cost of the engine. So I think that is a good step for us to take, and thank you for your leadership.

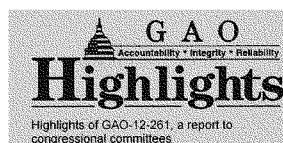
Senator CARPER. It doesn't get much better than that. It is a great combination. Win-win-win.

Senator SESSIONS. Mr. Chairman, I did note for the record here and offer for the record a summary of the GAO report on the various programs. This one is entitled Fragmented Federal Programs That Reduce Mobile Source Emissions, which is what we are talking about, Could Be Improved. That is the title of it. So one of the things we ought to look at is maybe exactly where we are targeting our resources, maybe we don't need quite so many programs, we

could actually get more money that could go out to transform our fleets.

Senator CARPER. Thank you. And with that, that will be part of the record. Thanks so much.

[The referenced information follows:]



Why GAO Did This Study

Exhaust from diesel engines is a harmful form of air pollution. EPA has issued emissions standards for new diesel engines and vehicles, but older mobile sources of diesel emissions—such as trucks and buses—continue to emit harmful pollution. Programs at DOE, DOT, and EPA provide funding for activities that reduce diesel emissions, such as retrofitting existing diesel engines and vehicles. The existence of these programs at multiple agencies has raised questions about the potential for unnecessary duplication. In response to a mandate in the Diesel Emissions Reduction Act of 2010, GAO examined the (1) extent of duplication, overlap, fragmentation, or gaps, if any, among federal grant, rebate, and loan programs that address mobile source diesel emissions; (2) effectiveness of federal funding for activities that reduce mobile source diesel emissions; and (3) extent of collaboration among agencies that fund these activities. GAO analyzed program data, documents, and relevant laws and regulations and interviewed agency officials. GAO also reviewed three diesel-related tax expenditures.

What GAO Recommends

GAO recommends that DOT's Federal Transit Administration develop performance measures for its two relevant strategic goals and that DOE, DOT, and EPA establish a strategy for collaboration among their programs that fund activities that reduce diesel emissions. DOE and EPA agreed with the relevant recommendation, and DOE questioned several findings. DOT disagreed with the recommendations. GAO continues to believe in the need for the performance measures and collaboration.

View GAO-12-261. For more information, contact David Trimble at (202) 512-3841 or trimble@gao.gov.

February 2012

DIESEL POLLUTION

Fragmented Federal Programs That Reduce Mobile Source Emissions Could Be Improved

What GAO Found

Federal grant and loan funding for activities that reduce mobile source diesel emissions is fragmented across 14 programs at the Department of Energy (DOE), the Department of Transportation (DOT), and the Environmental Protection Agency (EPA). From fiscal years 2007 through 2011, the programs obligated at least \$1.4 billion for activities that have the effect of reducing mobile source diesel emissions. The programs have varying goals and purposes; nevertheless, each program allows or requires a portion of its funding to support activities that reduce mobile source diesel emissions, such as replacing fleets of older diesel trucks or school buses with natural gas vehicles. In addition, each of the 14 programs overlaps with at least one other program in the specific activities they fund, the program goals, or the eligible recipients of funding. GAO also identified several instances of duplication where more than one program provided grant funding to the same recipient for the same type of activities. However, GAO was unable to determine whether unnecessary duplication exists because of limited information on program administrative costs, among other things. GAO did not find any gaps among the programs, such as mobile sources that are not eligible for funding.

The effectiveness of federal funding for activities that reduce mobile source diesel emissions is unknown because agencies vary in the extent to which they have established performance measures. DOE and EPA have established performance measures for the strategic goals related to their programs that reduce mobile source diesel emissions. DOT has established such measures for two of its administrations—the Federal Aviation Administration and Federal Highway Administration—but has not established such measures for the Federal Transit Administration for two of the four strategic goals that link to its programs that fund diesel emissions reduction activities. Instead, agency officials said they collect information on the current condition of the nation's transit fleet, among other things, to measure the performance of its programs. As GAO has previously reported, principles of good governance indicate that agencies should establish quantifiable performance measures to demonstrate how they intend to achieve their goals and measure the extent to which they have done so. In addition, 13 of the 14 programs have purposes other than decreasing diesel emissions, and diesel reductions are a side benefit of efforts to achieve these other goals. As a result, few programs collect diesel-related performance information. Incomplete performance information may limit the ability of agencies to assess the effectiveness of their programs and activities that reduce diesel emissions.

The programs that fund activities that reduce diesel emissions generally do not collaborate because of the differing purposes and goals of each program, according to senior DOE, DOT, and EPA officials. The officials also were sometimes unaware of other programs that fund similar activities and said that any existing collaboration was on a case-by-case basis. GAO's previous work has shown that although federal programs have been designed for different purposes, coordination among programs with related responsibilities is essential to efficiently and effectively meet national concerns. Further, without a coordinated approach, programs can waste scarce funds, confuse and frustrate program customers, and limit the overall effectiveness of the federal effort.

United States Government Accountability Office

Senator CARPER. Senator Boozman, welcome aboard. Thanks so much for being here.

Senator BOOZMAN. Thank you, and I have enjoyed working with you on this issue very, very much. I agree with Senator Sessions, I think the GAO says that we are spending over a billion dollars in ancillary stuff and needing to consolidate, fund the programs that work. Seriously, I asked Philip about the funding that had gone forward in the House. I think it is about \$19 million, which is interesting. That is three times what the Administration has asked for, and this very difficult time I think really illustrates how important a lot of people feel like this program is.

I think we all agree that this black soot is extremely toxic, and again, as the Chairman has pointed out and Senator Sessions, the bang for the buck with three to one leveraging, and then also the health care costs. It really does seem to be something that is a little bit of a no-brainer.

Mr. Singletary, you mentioned that Oklahoma is not participating. Is that because under the current funding of the \$6 million or whatever projected that it is not worth the administrative cost to the State to go forward?

Mr. SINGLETARY. Yes, Senator, that is correct. I believe the proposed allocation for States last year was just over \$71,000. The agency made the determination that the commitment of agency resources to implement that, that we could achieve better impact on air quality in Oklahoma by focusing those efforts elsewhere.

Senator BOOZMAN. So we are in a situation now where we have cut the funding and proposed funding and things such that we are, it is basically administrative costs, and we are not going to get a whole lot done. Can you all comment about that?

Mr. SCHAEFFER. Thank you for the question, Senator. I think you are exactly right. We have seen from the beginning of the DERA program adequate funding levels really drive results. And we can focus on larger numbers of fleets and vehicles and equipment and machines and that was done in the early parts of the program.

Now we are getting into more specific and difficult areas and ones that are quite significant. As Mr. Harris outlined, the cost to upgrade existing locomotive technology is quite significant and far beyond that of a single school bus. So as we get into diminishing funds, we can also run into a situation of diminishing returns, as we are unable to fund larger projects and we have situations that were just described. So I think as the agency has focused increasingly, I believe, this year on port activities, and those are some of the larger ticket items. So that will create some imbalances probably in how funds are allocated throughout the country. Just by the nature of the situation that we find ourselves in, not because of agency choice.

So I think a more fully funded program of course would benefit more parties, more entities, both large and small.

Senator BOOZMAN. What is the average age of the truck fleet? And you might comment on the diesel fleet. Then also you have the heavy equipment, the earth movers, things like that.

Mr. SCHAEFFER. Sure, thank you. I happen to have some specific data from Arkansas. Senator, in your State, about 24.7 percent of all commercial vehicles registered in the State today, and that is

Class 3 through Class 8, the smallest commercial trucks up to the largest tractor trailers, 24.7 percent of those are 2007 and newer. So they include the latest emissions control technology.

From a national perspective, about 11 percent of the trucks out there today are 2010 and newer. Those also incorporate very low emissions, NO_x reduction technology. So the fleet is improving in its average age. But we did go through a period of time during the 2008 through 2011 period, particularly, when the purchases of new technology were delayed because of the recession and the uncertainty about the economy.

Senator BOOZMAN. So part of that too was the uncertainty about the equipment also, wasn't it, in the sense that new technology, nobody really understood? I guess that was really pushed forward in a hurry. And there was concern about adequate testing.

Mr. SCHAEFFER. I think it is fair to say there was some uncertainty about the new technology and whether or not it would perform as suggested. Within the trucking industry, adoption of new technology, of any kind of new technology there is uncertainty. So that is correct.

I wanted to answer the off-road question a little bit. The average age of the off-road fleet is a really difficult question and one that we don't have the benefit of vehicle registration data. So what we find, though, in our sort of analysis of the situation, the best we can, find that those machine and pieces of equipment that are highly used, like backhoes and wheel loaders and dozers, are replaced quite often, because they are the primary tools of construction. There are some very old cranes and other machines that perform unique activities. But they only perform them in a very unique and limited period of time. So it is not like they are being used every day. They may be 20 years old, but they may only be being used a few hours each year on a very specific task. We are not able to really provide the average ages of all those machines and equipment. There are just too many and too many diverse types.

Senator BOOZMAN. If they are like my little tractor on my little farm, a lot of it is old.

Tell me, Mr. Singletary, you mentioned the voluntary nature of this. Can you elaborate on that?

Mr. SINGLETARY. I think that is a big plus to the program, is the voluntary nature. Like I said, the buses are the vehicles that we are primarily targeting in Oklahoma. Our school buses, school districts, especially during tough economic times, replacing a school bus is \$80,000, \$85,000. So any amount that can be offset through a grant program to replace a 30-year-old bus is something that is very helpful to get those old buses off the road.

Senator BOOZMAN. Very good.

Thank you, Mr. Ranking Member, and again, I appreciate you and Senator Carper working together. I think this is great. There is lots of stuff going on up here, but this is a great example of us really trying to come together and get some common ground and provide adequate funding for what appears to be from the studies and listing of people like yourselves that are out there every day fighting the battle of trying to control these things, a very worth-

while program. So hopefully we can work together to get the adequate funding that we need.

Yes, sir.

Mr. JOHNSON. I do have one comment to make. This is a very valuable program, obviously, for all the stakeholders. But it is over-subscribed. Six entities apply and only one gets it. So as long as there are volunteers that wish to use this technology, it is a great investment for everybody.

Senator BOOZMAN. Well, if it goes down to \$6 million, it is going to be way over-subscribed.

Senator SESSIONS. Senator Boozman, I don't know if you want one of those \$5,000 filters on your tractor or not.

[Laughter.]

Senator SESSIONS. It does raise the question of what we can afford, how many hours a vehicle is being used, how much we can afford to put in the older vehicles. We are not able to just completely eliminate that fleet. But looking at the numbers, the improvement we are seeing is rather remarkable. The trends are really, really good.

I noticed, and I mentioned the school bus manufacturing in Oklahoma, but those engines are made by NAVASTAR in Huntsville, Alabama, those diesel engines. Each one of them that goes out is very much an improvement on the environment.

Mr. Johnson, did you want to comment?

Mr. JOHNSON. Yes. The \$5,000 to \$7,000 that I quoted, much of it is engineering. It is labor to design the equipment, install it, monitor it and so on. The actual hardware is much less than that.

Senator SESSIONS. Are there things that we might could use that would be less efficient but more affordable for a small farm tractor or something of that kind? Have any technology improvements been made there?

Mr. JOHNSON. That raises an interesting question. Companies like mine invest in markets that look promising. So the interesting thing about DERA is that it was an incubator for a wide range of retrofit technologies.

So I am quite confident that if the market is there, the technology will be developed to address the market need, whether that market need is for a \$1,000 system or a \$150,000 system. So this is an incubation program in a lot of ways.

Senator SESSIONS. Good. Thank you. Thank you, Mr. Chairman.

Senator CARPER. Thank you. It has been really extraordinary. We have about 5 minutes to go, so we are going to ask maybe one more question, then we will have some questions for the record. I want to thank Senator Sessions, I really want to thank our staffs for the work that went into this.

Again, for Mr. Johnson and Mr. Schaeffer if I could, this will be my last question here today. Both of you mentioned in your testimony the cutting edge diesel technology that American companies have developed and are manufacturing here in the U.S. Mr. Johnson, I believe the comment you made was that you are building a new clean diesel manufacturing facility as we speak in New York, is that right?

All right. Can you talk about why this country, how did we end up as a leader, if you will, in clean diesel technology and what it

has meant for economic development and trade deficits in this country? Are there any programs or anything that the Federal Government can do to keep us on the cutting edge?

Mr. JOHNSON. Yes, that is an excellent question that I look at all the time. First of all, regarding the first part of your question on why the United States is leading this technology. I saw a presentation given just last week by Cummins. They showed, and others have shown the same thing, where the technology follows the regulation. Whenever there is a regulatory shift, there is a technology shift, for whatever reason. It is a very clear relationship.

We have the tightest regulations in the world on vehicles here in the United States. That is why we are a leader in developing these technologies.

With regard to exports, this plant that we are building is being designed to meet the worldwide requirements for our products. And the intent is to put a lot of the product into export from this plant to meet the needs in China and India.

The reason that we built it here, quite simply, is because of the tax incentives that we received at the State level and hopefully from the Federal level as well. They were instrumental in helping us make that decision.

Senator CARPER. Thank you.

Mr. Schaeffer, please.

Mr. SCHAEFFER. Thank you, Senator Carper.

The recent economic study that the Diesel Technology Forum commissioned, which was completed by Aspen Environmental Group and M.Cubed, found that diesel engines, fuel and equipment are very high value as exports and account for about 4.4 percent of all exports. That is about a \$46.2 billion annual figure.

In the course of doing that, we learned that about one in four of all diesel engines produced in the U.S. is destined for a market overseas. So diesels are a high value export. The technology is really in the forefront, not only of reducing emissions but also the kinds of things that are highly valued; fuel efficiency, reliability, durability, and performance that diesel offers. The U.S. manufacturers and the members of our organization have really been the forefront of making the billions of dollars of investments that have been necessary to produce these products that people want to buy around the world.

So in terms of things that can be done, certainly incentives to encourage more research and development, the Department of Energy's Super Truck program is doing a great job in facilitating new fuel-efficient truck technology for the next century. And incentives to help fleets create and invest in new technology were mentioned earlier. I think those are important considerations. We are seeing those play out right now in the agricultural sector, where many farmers have taken advantage of some tax advantages that have allowed them to invest in a lot of new equipment the last few years.

So that is better fuel-efficient technology for them, and fewer emissions for our environment. So those are very important programs.

Senator CARPER. Excellent. That is all we have time for today, time is running out on the clock. Again, thank you so much for

being here, thank you for the great work that you are doing in this arena, whether you happen to be doing the R&D, manufacturing the technology, implementing the technology, in ways that are just very, very encouraging.

I usually take the train down in the morning and go back at night. A lot of times I walk down the platform to get on the train in the morning when I catch it, and I stop and talk to people, mostly from Delaware but some from Pennsylvania or New Jersey. And they say, how are you doing, how are you doing, I have a friend when you ask him, how are you doing, he says, compared to what?

Well, I almost always say, I am happy. People say, how can you be happy? You are going to work, and don't you work in the Senate? That must be a terrible place to work these days. If they could be with us today, they would see why I am happy. I am happy and I am encouraged. In adversity does lie opportunity, thank you, Mr. Einstein, for that quote. But there is plenty of adversity, reliance on foreign oil, fossil fuels, creating a lot of pollution, climate change, health care problems for young people and old, all kinds of adversity. But there is real opportunity here, there is real opportunity in a cost effective way to address those elements of adversity and actually do them a lot better, and at the same time, create jobs and create economic activity here in our country.

Thank you for remind us that it is possible to do it and do well at the same time. This is a great example. And a great example for us to focus on that 80-20 rule here in Washington, DC. This is certainly that 80 percent that we can agree on.

And we just need to bear down and do more. Thank you so much.

We have 2 weeks for Senators to submit their questions and materials for the record. We just ask that you respond promptly to those questions.

Again, thank you for a great job. Terrific panel. We have four or five of us here today, I wish everybody on the Committee could have actually been a part of this hearing. They would have been as happy as I am and as encouraged as I am.

Thank you so much. With that, we are adjourned.

[Whereupon, at 12:03 p.m., the Subcommittee was adjourned.]

